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NATIONAL DAM INSPECTION PROGRAM. TWO MILE RUN DAM (NDI PA-254),--ETC(U)
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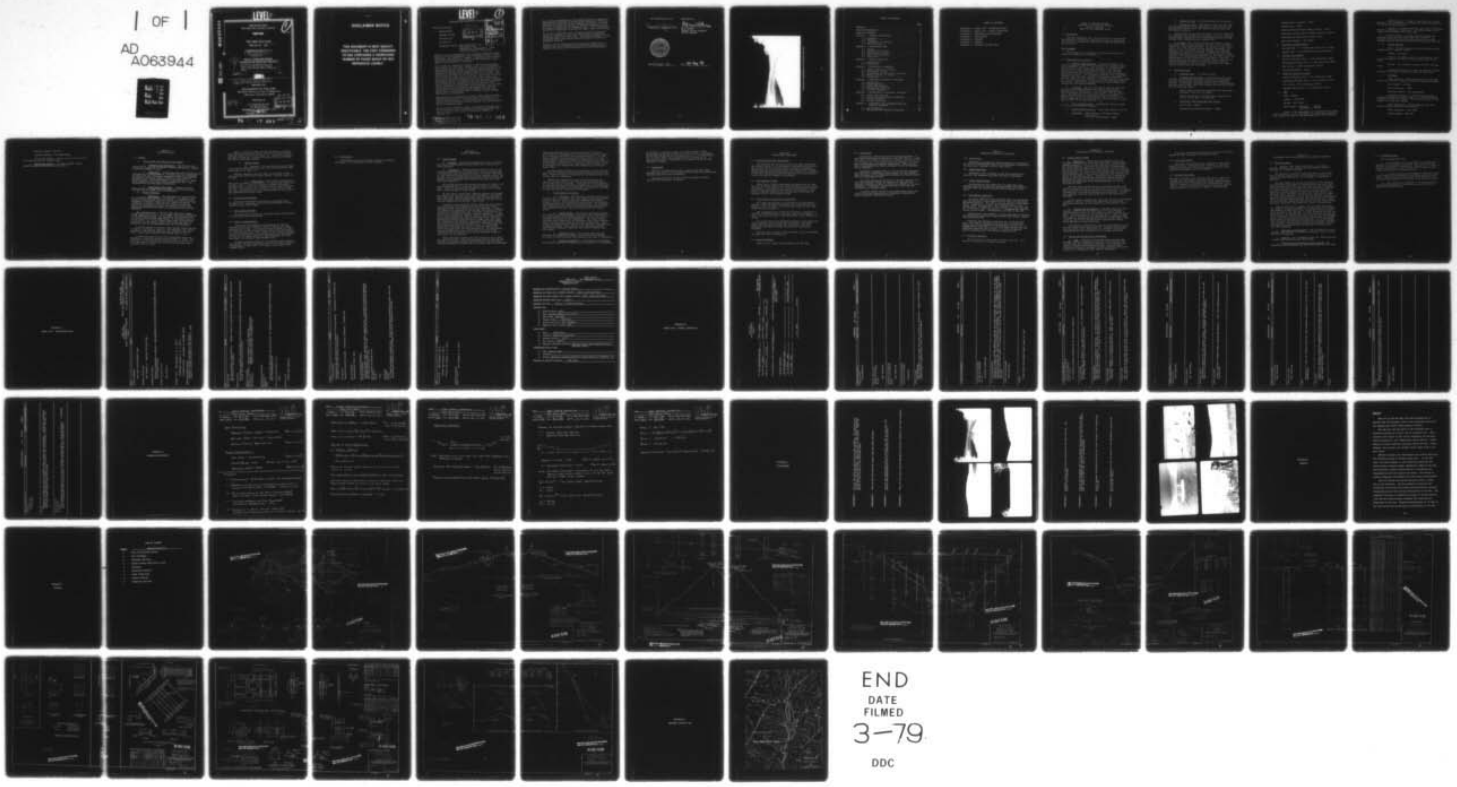

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LEVEL II

OHIO RIVER BASIN
TWO MILE RUN, VENANGO COUNTY

PENNSYLVANIA

TWO MILE RUN DAM
NDI No. Pa. - 254

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

Two Mile Run Dam (NDI PA-254), Ohio River Basin, Two Mile Run, Venango County, Pennsylvania. *Phase I Inspection Report.*

(15) DACW31-78-C-0052

PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(12) 74p.

PREPARED BY

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

(11) AUGUST 1978

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LEVEL II

(1)

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Two Mile Run Dam

Pennsylvania

Venango County

Two Mile Run

27 July 78

Inspection Team - CAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146
Contract No. DACW31-78-C-0052

Based on a visual inspection and available engineering data, the dam and its appurtenances are considered to be in good condition. The project is capable of passing and/or storing the runoff resulting from a storm of PMF magnitude; consequently, the spillway is adequate.

At the time of inspection, between 1 and 2 cfs of seepage was issuing from the right abutment near the valley bottom, just downstream of the dam. A remedial grouting program was implemented shortly after construction which succeeded in reducing the seepage from approximately 4 to 1.5 cfs. This program was initiated by the Soil Conservation Service and was carried out under their direction. Weirs were installed and readings taken periodically to gage the seepage flow. Piezometers were also frequently read to gage pore pressures in critical areas. According to Mr. Ice of the Soil Conservation Service, the piezometer readings currently fall within acceptable or predicted limits and have done so since the remedial grouting program was implemented. The SCS concluded that the program was successful and that the expenditure of additional funds to further reduce seepage flow would be unwarranted.

According to Mr. Cathcart of the Soil Conservation Service, the piezometers are now only read when a directive is received from Harrisburg. In addition, the weirs were in a state of disrepair at the time of inspection, and flow could not be accurately gaged.

Because of the potential danger to downstream inhabitants, it is imperative that a detailed physical measurement program be continued in order to detect any changes in seepage flow.

It is thus recommended that the damaged weirs be repaired or replaced and a program of surveillance continued. The program should include periodic re-mapping of spring locations in order to detect new springs or spring migration, as well as frequent monitoring of piezometer data. This information should be transmitted to the SCS for their review and action.

It is also recommended that a warning system be developed which will provide for the safe evacuation of downstream residents should the need arise. This program should include round-the-clock surveillance during periods of intense or prolonged rainfall.

Finally, it is recommended that the dam be inspected on a yearly basis by a registered professional engineer experienced in the design and construction of earth embankments.

GAI Consultants, Inc.

Bernard M. Mihalcin, P.E.

Date 13 Sept 78

Approved by:

C. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Date 22 Sep 78

Overview Photograph of Two Mile Run Dam

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
TWO MILE RUN DAM
NDI# PA-254, PENNDER# 61-19

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

~~1.1 Purpose~~.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Two Mile Run Dam is an earth embankment 1,000 feet in length with a maximum height of approximately 85 feet. The facility is equipped with both a service and an emergency spillway. The service spillway is a reinforced concrete, drop inlet, vertical riser connected at its base to a 36-inch diameter concrete horizontal conduit. The emergency spillway is a trapezoidal channel, 200 feet wide, excavated in natural ground and located along the left abutment. Drawdown control is provided by a 30-inch slide gate at the base of the upstream side of the riser. The service spillway and low level conduit are located near the dam centerline.

b. Location. Two Mile Run Dam is located along Two Mile Run in Oakland Township and Sugar Creek Borough, Venango County, Pennsylvania. It is approximately five miles northeast of Franklin, Pennsylvania. The dam, reservoir, and watershed are contained within the Franklin, Dempseytown, Oil City, and Titusville South U.S.G.S. 7.5 minute quadrangles (see Appendix G). The coordinates of the dam are N41° 27' 55" and W79° 46' 15".

c. Size Classification. Intermediate (85 feet high, 3,270 acre-feet storage capacity).

d. Hazard Classification. High (see Section 3.1.C.3).

e. Ownership. Commissioners of Venango County
Court House
Franklin, Pennsylvania 16323

f. Purpose of Dam. Flood prevention and recreation.

g. Historical Data. The design of Two Mile Run Dam was performed by the U. S. Department of Agriculture, Soil Conservation Service under the Resource Conservation and Development Program.

Construction of the facility began in July of 1969 and was scheduled for completion by December of 1970. However, harsh weather conditions and an extensive grouting program delayed final completion until August 1971.

In December 1971, while the pool was filling, spring flows were observed approximately 250 feet from the downstream toe along right abutment. As the pool level continued to rise, the discharge of the springs increased. In February 1972, additional springs appeared some 500 feet downstream of the toe of the dam. Studies were made and supplementary grouting was performed on the basis of these studies. The supplementary grouting cut the water flow from approximately 4 to 1.5 cubic feet per second. The Soil Conservation Service eventually decided on the basis of its dam construction experience and because they could not clearly identify an area for grout application that additional grouting was not justified.

1.3 Pertinent Data.

a. Drainage Area. 8.4 square miles.

b. Discharge at Dam Site. Conversations with Lyle Cathcart of the Franklin Office of the Soil Conservation Service indicated the emergency spillway has never discharged. Furthermore, the water level, to his recollection, has never been higher than a few inches over the top of the service spillway riser.

Outlet Works Conduit at Operating Pool Elevation - Discharge curve not available.

Spillway Capacity at Maximum Pool Elevation (el. 1257.6 top of dam) ≈ 23,500 cfs.

c. Elevation (feet above mean sea level).

Top of Dam - 1257.6.

Maximum Pool Design Surcharge - 1250.5.

Maximum Pool of Record < 1247.

Normal Pool - 1240.

Upstream Portal Outlet Conduit Invert - 1175.

Downstream Portal Outlet Conduit Invert - 1170.5.

Streambed at Centerline of Dam ≈ 1173.

Maximum Tailwater - Not known.

d. Reservoir Length (miles).

Maximum Pool ≈ 1.5 (elevation 1257.6 top of dam).

Normal Pool ≈ 1.3 (elevation 1240 normal pool).

e. Storage (acre-feet).

Service Spillway Crest ≈ 3,270 (elevation 1240).

Emergency Spillway Crest ≈ 4,425 (elevation 1247).

Top of Dam ≈ 6,300 (elevation 1257.6).

Design Surcharge ≈ 1,875.

f. Reservoir Surface (acres).

Service Spillway Crest ≈ 144 (elevation 1240).

Emergency Spillway Crest ≈ 163 (elevation 1247).

Top of Dam ≈ 193 (elevation 1257.6).

Maximum Design Pool ≈ 174 (elevation 1250.5).

g. Dam.

Type - Earth.

Length - 1,000 feet.

Height - 84.6 feet.

Side Slopes - Upstream 2.93H:1V
Downstream 2.44H:1V

Zoning - The embankment is a modified zoned earth-fill structure. It is essentially an impervious structure with a pervious zone on the downstream face (see Figure 2).

Impervious Core - Figure 2 indicates the central portion of the embankment is composed of clays compacted to 95 percent maximum density.

Cutoff - A cutoff trench was apparently constructed along the embankment centerline. The bottom width of the trench varies from 12 feet to 55 feet.

Grout Curtain - A stage grouting program was performed along the dam centerline (see Figure 4). A remedial grouting program was carried out on the right abutment between Stations 4+20 and 0-20 after construction.

h. Outlet Conduit.

Type - 36-inch reinforced concrete pressure pipe supported on a concrete cradle.

Length - 520 feet.

Closure - Drawdown control is provided by a 30-inch slide gate at the base of the upstream face of the riser.

Access - Gate control located atop the vertical riser.

Regulating Facilities - Flow is regulated solely by means of the valve control located atop the riser.

i. Spillway.

Type (Service) - Drop inlet vertical riser connected to a 36-inch diameter horizontal discharge conduit.

Weir Length - 18 feet.

Crest Elevation - 1240.

Upstream Channel - Not applicable.

Downstream Channel - A 16-foot bottom width, trapezoidal shaped, outlet channel is located beyond the discharge end of the conduit. The initial 20 feet of the channel is lined with riprap.

Type (Emergency) - Unlined channel cut into natural ground along the left abutment.

Crest Elevation - 1247 feet.

Channel Width - 200 feet.

Channel Length ≈ 300 feet.

Upstream Channel - Not applicable.

Downstream Channel - Narrow valley characterized by steep and heavily wooded slopes.

j. Regulating Outlets. 30-inch diameter intake portal located at the base of the riser.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. Design data and calculations could not be obtained in visit to SCS archives, although records were somewhere in files.

2. Embankment. Design data and calculations were not available at the SCS archives. Detailed logs of drillholes and test pits and laboratory compaction tests are presented on as-built drawings, copies of which are available in PennDER files. An SCS memorandum, dated February 26, 1968, which summarizes pertinent design parameters, etc., was obtained from the Harrisburg SCS Office.

3. Appurtenant Structures. Design data and calculations are reportedly available at the SCS archives, but could not be retrieved on visit to SCS office.

b. Design Features.

1. Embankment. The embankment is characterized as a modified zoned earthfill structure. In essence, the zoning is transitional with the cutoff and central section composed of the most impervious soil borrow available. As indicated on Figure 2, more pervious zones are implied within the downstream section, the limits of which were apparently controlled by material availability during construction.

The embankment has a 24-foot wide crest and a downstream slope of 2.93H:1V. Two benches were also constructed on the downstream slope; the top bench, at elevation 1237, is 15 feet wide and the lower bench, at elevation 1201, is 33 feet wide. An 18-inch thick riprap zone (measured perpendicular to the slope) extends from elevation 1236 to elevation 1244 on the upstream slope of the embankment.

A cutoff trench is located along the dam centerline and is shown in profile on Figure 4. As indicated, the cutoff extends to rock between approximately Stations 4+50 and 8+46. Beyond this interval, the trench lies in soil.

A three-row grout curtain was constructed along the embankment centerline between Stations 4+00 to 10+40. The thickness of rock grouted varied from about 15 to 55 feet with the base of the curtain varying from approximately elevation 1150 to 1190.

Since a positive cutoff was not attempted, a substantial downstream drainage blanket was also provided between Stations 11+65 to 3+25 (see Figure 5). Positive drainage is provided through two 12-inch drain pipes that exit through the outlet structure endwall.

2. Appurtenances.

a) Spillway. The Two Mile Run Dam spillway is an unlined channel cut in soil on the left abutment (see Photograph 1 and Figure 1).

As-built drawings indicate that the spillway is 200 feet wide with 3H:1V side slopes having a minimum height of 11 feet.

b) Outlet Works. The service spillway is a drop inlet structure consisting of a 70-foot high reinforced concrete riser. A 36-inch diameter reinforced concrete drawdown pipe, resting on a concrete cradle, passes beneath the dam. The system is provided with a gate control atop the riser which operates a 30-inch slide gate at the base of the upstream face of the riser.

2.2 Construction Records.

Bi-weekly construction records are available from PennDER files. Numerous construction photographs are also available from these files.

2.3 Operational Records.

No operational records are available since the facility is essentially self-regulating.

2.4 Other Investigations.

A geologic investigation was performed in 1972 to determine the zone or zones of leakage through the right abutment of the dam. A resistivity survey showed at least two anomalies in the right abutment which were interpreted as water bearing zones. The results of the geologic investigation and conclusions and recommendations are contained in a report by Mr. Louis Kirkaldie, dated December 18, 1972. The report is available from PennDER files.

A report entitled "Erosion and Sediment Control Plan" for Two Mile Run was prepared by the U.S.D.A. Soil Conservation Service in June 1973. The report is available from PennDER files.

2.5 Evaluation.

Sufficient data are available to make an accurate assessment of the condition of the facility.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the structure and related appurtenances suggest that the facility is in good condition.

b. Embankment. As-built plans indicate that the upstream slope of the dam is 2.93H to 1V and is provided with a 33-foot wide berm at elevation 1201. A 15-foot wide berm is also present at elevation 1237 on the upstream slope. An 18-inch layer of durable riprap overlies 6 inches of riprap bedding on the upstream face between elevations 1236 and 1244 (see Figure 2).

The downstream face of the dam is sloped at 2.44H to 1V and is provided with a 22.5-foot wide berm at elevation 1205. Both the upstream and downstream slopes are mantled with a thick growth of crown vetch.

At the time of inspection, numerous springs were noted near the toe of the dam on the right abutment. Dilapidated weirs were also located suggesting that the flow had once been monitored. The estimated flow from the springs at the time of inspection was between 1 and 2 cfs.

A review of the available files indicates that shortly after construction and while the pool level was rising (December 1971), the springs were first observed. It was not immediately apparent if the springs were natural springs reflecting increasing flow due to weather conditions or if the springs represented leakage from the reservoir. In any case, it was decided to continue filling the reservoir until additional springs were noted in February 1972. The Soil Conservation Service then decided to reduce the pool level and investigate the problem. Many holes were found within the reservoir area several hundred feet upstream of the dam where water was leaking into the ground. A resistivity survey was initiated, the results of which indicated at least two major zones of high permeability. An exploratory drilling program was also carried out to correlate the results of the resistivity data and to shed more light on the extent of the leakage.

Total estimated seepage when the reservoir was 75 percent full was 4 cfs. The conclusion was that in general the seepage was passing through very weathered, very fractured and very permeable sandstone and to a lesser extent interbedded

shale and siltstone units of the Pottsville Formation. Coefficients of permeability in the sandstone ranged from 2 to 70 feet per day where flow could be measured. In some cases, seepage flow exceeded the pumping rate of 40 gpm. A supplementary grouting program was recommended and implemented which reduced the total flow to approximately 1.5 cfs at full pool in March 1974. Subsequent weir readings indicated that total seepage had been reduced to 0.4 cfs by March 1976.

As mentioned previously, the condition of the weirs at the time of inspection did not permit direct readings to be made. However, flow was estimated to be between 1 and 2 cfs at the time of inspection.

Additional seepage was noted discharging from the natural hillside just to the left of the discharge end of the primary outlet structure. Although the flow appeared to be issuing from the same stratigraphic level as the seepage on the right abutment, the volume was estimated at less than 10 gpm and was not considered significant.

c. Appurtenant Structures.

1. Spillway. The emergency spillway serving Two Mile Run Dam is a grass- and crown vetch-lined channel excavated in glacial soils on the left abutment (see Photographs 1 and 4). The spillway discharges into the natural downstream drainage channel south of the dam. No conditions were observed at the time of inspection which suggest that the spillway would not function properly during a flood event.

2. Outlet Works. The service spillway consists of a drop inlet and reinforced concrete riser connected to a 36-inch diameter outlet pipe which exits at the toe of the dam near the center of the embankment. Low level stream recharge can be regulated by operating a gate valve controlling a 30-inch sluice gate at the base of the riser. The outlet was discharging at the time of inspection and appeared in good condition. The concrete riser and gate control could not be examined since they are several hundred feet from shore.

3. Reservoir Area. The slopes adjoining the reservoir are moderate to steep and predominantly wooded. No signs of slope distress were noted at the time of inspection.

4. Downstream Channel. Approximately 6 dwellings are located along the floodplain with 3 miles of the embankment.

In addition, a chemical plant is situated about 4 miles downstream and approximately 1,500 feet from the confluence of Two Lick Creek and the Allegheny River. It is conceivable that a large number of persons could be affected by an embankment breach. Consequently, the hazard rating for this facility is "high".

3.2 Evaluation

There is considerable seepage issuing from the right abutment near the toe of the dam and the valley floor requiring constant monitoring and evaluation.

Measurements taken in the field correspond to those shown on the 'as-built' drawings.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operational Procedures.

The Two Mile Run facility is used for both recreation and flood control. It is essentially self-regulating requiring minimal attention with respect to normal operations. The majority of the maintenance is provided by the Venango County Park and Recreaticnal Authority; however, Mr. Cathcart of the Soil Conservation Service oversees the work pertaining to the dam and suggests maintenance.

4.2 Maintenance of Dam.

There are no formal maintenance procedures at the dam. The dam is covered with crown vetch and thus requires little maintenance. Mr. Cathcart of the Soil Conservation Service oversees any maintenance required for the structure. The dam is inspected yearly by Mr. Gerald Frye (Park Superintendent) and Mr. Lyle Cathcart (SCS).

4.3 Maintenance of Operating Facilities.

No formal maintenance is performed on the mechanical systems. The low level streamflow line (blow-off) was last opened in 1974 in order to drop the pool level so that the beach could be extended.

The piezometers are currently read when a directive is received from Harrisburg. They were last read in March 1978. The data are sent to the SCS Office in Harrisburg for review.

The weirs which once monitored leakage issuing from the right abutment are currently non-functional. The local office is reportedly waiting for a directive from the Harrisburg SCS Office before the weirs are repaired or replaced.

The cold water intake on the concrete riser was blocked off sometime after construction.

4.4 Warning System.

There are no formal warning systems at the site.

4.5 Evaluation.

Although an "Operations and Maintenance Handbook" is reportedly available for sponsors at the SCS Office, it does not appear that formal procedures concerning maintenance of the blow-off line, weir maintenance and headings, and piezometer monitoring are formally established. The blow-off pipe is considered functional although it was not operated in our presence.

Following a meeting with Mr. Ice of the Soil Conservation Service in Harrisburg, Pennsylvania, it was learned that the plots of the piezometer readings lie within acceptable or predictable levels.

The weirs which were provided to monitor seepage from the right abutment should be repaired or replaced and readings compiled in order to detect any change in volume or turbidity. Piezometers should continue to be read and evaluated on a regular basis.

A warning system should be developed which would provide for the safe evacuation of downstream inhabitants should hazardous conditions develop.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Dam.

Hydrologic and hydraulic design reports are available at the Soil Conservation Service in Harrisburg, Pennsylvania, but could not be retrieved in visit to their office.

5.2 Experience Data.

According to Mr. Cathcart of the Soil Conservation Service, the emergency spillway has never functioned.

5.3 Visual Observations.

On the date of the inspection, no conditions were observed that would indicate the appurtenant structures of the dam could not operate satisfactorily during a flood event.

5.4 Overtopping Potential.

The ratio "PMF Peak Flow/Drainage Area" was determined from an empirical curve supplied by the Corps of Engineers, Baltimore District. The curve used was the Ohio River Basin Curve. Based on this curve and a drainage area of 8.4 square miles, Peak PMF Q/A = 1575 cfs/sq. mi., and Peak PMF Q = 13,230 cfs. The size category is "intermediate" and the hazard rating "high". Consequently, the SDF is the PMF.

Calculations (See Appendix C) were performed to evaluate the overtopping potential using spillway and storage capacities during the PMF.

Assuming the spillway discharges as a broad-crested weir, the as-built emergency spillway has a maximum discharge capacity equivalent to approximately 23,500 cfs. A comparison of Peak PMF Q (13,230 cfs) with maximum spillway discharge indicates the spillway is capable of passing and/or containing the flow resulting from the PMF.

5.5 Spillway Adequacy.

The facility will pass and/or contain the PMF. As a result, the spillway is deemed adequate.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appeared to be in good condition. Considerable seepage (between 1 and 2 cfs) was observed emanating from the right abutment, beginning 50 feet from the downstream toe of the dam and above the valley bottom. This condition was first noted shortly after construction when the reservoir began filling. The water level was lowered and a resistivity and drilling program initiated to determine the location and extent of the seepage zones. Following this investigatory phase, a grouting program was carried out which reportely succeeded in reducing the seepage from 4 cfs at the 75 percent reservoir full level to approximately 1.5 cfs at full pool in 1974.

The Soil Conservation Service eventually decided that further grouting could not be justified particularly since they could not clearly delineate an area for grout application; consequently, the grouting program was terminated. The SCS did, however, continue monitoring flow at the weirs until recently.

At the time of inspection, the weirs were in a dilapidated condition, and the seepage flow could not be accurately determined although it was estimated to be between 1 and 2 cfs.

b. Appurtenant Structures. The drop inlet and reinforced concrete riser and gate valve were not directly observed since access to them cannot be gained without a boat. The drop inlet was functioning at the time of inspection, and no conditions were observed which suggested that it could not function adequately during a flood event. The discharge end of the 36-inch outlet pipe and the impact basin appeared in good condition.

The emergency spillway is a grass-lined channel cut in glacial soils on the left abutment. Although the spillway has reportedly never functioned, it appears to have been constructed to line and grade and is in good condition.

6.2 Design and Construction Techniques.

a. Dam. Available engineering data obtained from PennDER and Soil Conservation Service files indicate the facility has been adequately designed in conformance with modern accepted engineering practices. Many of these features are proven, standard SCS designs which have previously been incorporated into similar structures.

Bi-weekly construction reports and construction photographs are also available from PennDER files.

6.3 Past Performance.

Reservoir level records are available to the period March 31, 1978. According to Mr. Cathcart of the Soil Conservation Service, the facility has functioned satisfactorily throughout its brief history.

6.4 Seismic Stability.

The dam is located within Seismic Zone No. 1, and it is thought that the static stability of the structure is sufficient to withstand minor earthquake-induced dynamic forces. However, no calculations, investigations, etc., were performed to confirm this belief since this type of study is beyond the scope of a Phase 1 investigation.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection, operational history, and available engineering data suggest that the facility is in good condition.

The project is capable of passing and/or storing the flow resulting from a storm of PMF magnitude without overtopping the dam; therefore, the spillway is considered adequate.

The only object of concern pertaining to the facility is the seepage flow which is emanating from the right abutment near the toe of the dam just above the valley bottom. The Soil Conservation Service (the dam designers) initiated an investigatory program as well as a remedial grouting program to reduce seepage shortly after construction. In addition, they continued to monitor the flow with a system of weirs until recently. It is their contention that the program was successful and that the expenditure of additional funds to further reduce seepage flow is unwarranted. Part of this feeling undoubtedly stems from the Soil Conservation Service's experience with dams and similar circumstances.

Even if most of the seepage flow has been reduced by the remedial grouting program, it is impossible to determine the effects of high pool levels (experienced during severe storm events) on the springs. It also should be pointed out that some of the springs exit from the hillside as close as 50 feet from the downstream face of the dam and that seepage water eventually can find new paths, giving rise to concern after years of satisfactory performance. It is imperative that the physical measurement program be detailed, reliable and accurate. The damaged or broken weirs suggest that the surveillance program at the Two Mile Run facility may be less than adequate.

b. Adequacy of Information. The available data were thought to be sufficient to make an accurate Phase I assessment of the facility.

c. Urgency. It is suggested that the recommendations listed below be implemented immediately.

d. Necessity for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations.

It is recommended that:

a. The damaged weirs be repaired or replaced and a program of surveillance continued. This program should include the periodic re-mapping of the springs (in order to detect any increase in the seepage area) as well as continued monitoring of piezometer data.

b. A warning system be developed to provide for the safe evacuation of downstream inhabitants should the need arise. This program should include round-the-clock surveillance during periods of intense or prolonged rainfall.

c. The facility be inspected on a yearly basis by personnel experienced in the design and construction of earth- and rockfill dams.

APPENDIX A

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Two Mile Run Dam (Edith C. Justice Dam)

ID # NDI# PA-254; PennDER 61-19

ITEM	REMARKS	SHEET 1

AS-BUILT DRAWINGS

Available from PennDER files.

REGIONAL VICINITY MAP

See Appendix G - Regional Vicinity Map.

CONSTRUCTION HISTORY

Bi-weekly construction reports, correspondence and construction photographs are available from PennDER files.

TYPICAL SECTIONS OF DAM

See Figure 2.

OUTLETS - PLAN See Figures 3, 6, 7, and 8.

- DETAILS See Figures 3, 6, 7, and 8.

- DISCHARGE RATINGS Available in PennDER files.

RAINFALL/RESERVOIR RECORDS

Rainfall records available at SCS office.
Reservoir records available up to March 31, 1978.

ITEM	REMARKS	ID # PA-254	SHEET 2

DESIGN REPORTS

May be available in SCS archives. Summary report on geology and stability supplied by the SCS office in Harrisburg.

GEOLOGY REPORTS

Two reports available from PennDER files detailing subsurface investigation and resistivity survey for remedial grouting program.

DESIGN COMPUTATIONS

HYDROLOGY & HYDRAULICS	May be available in SCS archives.
DAM STABILITY	Summary report available from PennDER files.
SEEPAGE STUDIES	Seepage studies detailed in PennDER files.

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

Logs of drill holes and test pits as well as compaction data available on as-built plans and from PennDER files.

POST-CONSTRUCTION SURVEYS OF DAM

None.

BORROW SOURCES

Within the reservoir.

MONITORING SYSTEMS

Piezometers read when directive is received from Harrisburg. Information is plotted and contained within SCS files in Harrisburg.

MODIFICATIONS

Remedial grouting program. Cold water discharge - blocked off.

HIGH POOL RECORDS

Approximately 1241.5 feet.

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

Detailed seepage study carried out after construction. A remedial grouting program was implemented as a result of this study. Erosion and sediment control plan for Two Mile Run site published in 1973.

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

None.

MAINTENANCE
OPERATION
RECORDS

No formal maintenance records kept. Normal maintenance performed by County Park and Recreational Authority with the supervision of Mr. Cathcart of the SCS.

ITEM	REMARKS	ID # PA-254	SHEET 4

SPILLWAY PLAN See Figures 1 and 9.

SECTIONS See Figures 4 and 9.

DETAILS See Figures 1, 4, and 9.

OPERATING EQUIPMENT PLANS & DETAILS See Figures 6, 7, and 8.

NDI# PA-254

CHECK LIST ID # PennDER# 61-19

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 8.4 sq. miles.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1240; 3,270 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1247; 4,425 acre-feet.

ELEVATION MAXIMUM DESIGN POOL: 1250.5.

ELEVATION TOP DAM: 1257.6; ≈ 6,300 acre-feet.

SPILLWAY DATA:

a. Crest Elevation 1247.
b. Type Unlined channel cut in soil.
c. Weir Length 200 feet.
d. Channel Length ≈ 300 feet.
e. Location Spillover Left abutment.
f. Number and Type of Gates None.

OUTLET WORKS:

a. Type Drop inlet.
b. Location Center of reservoir.
c. Entrance Inverts 1175.
d. Exit Inverts 1170.5.
e. Emergency Draindown Facilities 30-inch sluice gate controlled atop concrete riser.

HYDROMETEOROLOGICAL GAGES:

a. Type None at dam.
b. Location -
c. Records Rainfall records available at SCS office in Franklin, PA.

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX B

CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

DAM NAME Two Mile Run Dam COUNTY Venango STATE PA ID # NDI# PA-254 PennDER# 61-19

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION 7-27-78 WEATHER overcast TEMPERATURE 70°

POOL ELEVATION AT TIME OF INSPECTION 1240± 0.1 M.S.L. TAILWATER AT TIME OF INSPECTION ≈1171.5 M.S.L. Top of outer edge of catch basin.

INSPECTION PERSONNEL:

B. M. Mihalcin (GAI)

J. P. Nairn (GAI)

D. L. Bonk (GAI)

Lyle Cathcart (SCS)

D. L. Bonk RECORDER

EMBANKMENT ID# PA-254 Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Excellent.	
RIPRAP FAILURES	None observed. Riprap extended 5 feet above pool level at time of inspection. Riprap consists of a well graded durable limestone with 2-foot maximum diameter.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Excellent condition.	
ANY NOTICEABLE SEEPAGE	Leakage is clearly visible emanating through the right abutment approximately 50 to 100 feet downstream of the toe. Flow is estimated to be between 1 and 2 cfs. Leakage is also evident immediately beyond the left side of the outlet discharge. The leakage emanates 14 feet above the water level which makes it roughly parallel to the leakage detected along the right abutment.	
STAFF GAGE AND RECORDER	None observed.	
DRAINS	Steel grate over impact basin placed in 1972.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	All visible concrete surfaces are in excellent condition.	
INTAKE STRUCTURE	Concrete riser is located in the reservoir and is not accessible. That portion which is visible appears to be in excellent condition.	
OUTLET STRUCTURE	Discharge basin in excellent condition. 36-inch main outlet discharging during inspection. Toe drains also discharging. Flow from toe drains is being slightly impeded due to tailwater (see elevation on cover). Flow depth is approximately 1 foot over the basin lip.	
OUTLET CHANNEL	Rock-lined channel in excellent condition. Rock is apparently comprised of limestone and sandstone. Channel is unobstructed for at least 200 feet.	
EMERGENCY GATE	Gate located at the base of the riser is not accessible. Manual gate control situated atop the riser is visible but could not be examined closely due to a lack of access.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None observed.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Trapezoidal channel cut into natural ground. Spillway discharges into a low area at the base of a hillside perpendicular to the channel beyond the left abutment.	
BRIDGE AND PIERS	A small concrete roadway bridge located approximately 2,500 feet downstream is the first obstruction.	

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

MONUMENTATION/SURVEYS

None observed.

OBSERVATION WELLS

None observed.

WEIRS

Remnants of a weir are visible along the right abutment approximately 150 feet to 200 feet downstream.

PIEZOMETERS

Located in a circular trench approximately 20 feet below the downstream berm and to the right of the discharge conduit. These could not be observed due to a locked steel hatch that covered the trench.

OTHERS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate to steep slopes that are heavily wooded in some areas and cleared in others. Parts of the shoreline have been developed for recreational uses.	
SEDIMENTATION	None observed.	

DOWNSTREAM CHANNEL ID # PA-254 SHEET 8

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)		
SLOPES	Moderate to steep and heavily wooded slopes immediately downstream. Floodplain eventually widens as the stream moves towards its confluence with the Allegheny River, however, the side hill slopes remain steep and wooded.	
APPROXIMATE NO. OF HOMES AND POPULATION	Four permanent dwellings lie in the floodplain approximately 3 miles downstream. A chemical plant is situated near the confluence of Two Mile Run and the Allegheny River.	

APPENDIX C

HYDRAULICS/HYDROLOGY

SUBJECT DAM SAFETY INSPECTION
TWO MILE RUN

BY DLB DATE 8-7-78 PROJ. NO. 78-501-254

CHKD. BY JTS DATE 8-11-78 SHEET NO. 1 OF 5

GAI CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

DAM STATISTICS

MAXIMUM HEIGHT OF DAM = 84.6 FEET (REF 1: DRWG 1)

DRAINAGE AREA = 8.4 sq.mi. (5376 ACRES) " "

STORAGE CAPACITY ≅ 3266 ACRE-FEET (REF 2: pg 1)

SIZE CLASSIFICATION

DAM SIZE - INTERMEDIATE (REF 3: TABLE 1)

HAZARD RATING - HIGH (POSSIBLE LOSS OF LIFE > 3)

REQUIRED SDF = PMF (REF 3: TABLE 3)

REFERENCES

1 : "TWO MILE PROJECT" AS-BUILT PLANS, U.S.D.A., SOIL CONSERVATION SERVICE

2 : "REPORT UPON THE APPLICATION OF THE VENANGO COUNTY COMMISSIONERS TO CONSTRUCT TWO MILE RUN DAM", PENNDER, MARCH 14, 1969

3 : "RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS" DEPT. OF THE ARMY - OFFICE OF CHIEF ENGINEER, APPENDIX D

4 : "STANDARD HANDBOOK FOR CIVIL ENGINEERS" F.S. MERRITT, McGRAW-HILL 1976

5 : "HYDRAULICS ON BROAD-CRESTED SPILLWAYS" U.S.D.A., SOIL CONSERVATION SERVICE, TECHNICAL RELEASE No. 39

SUBJECT DAM SAFETY INSPECTION
TWO MILE RUN

BY DLP DATE 8-7-78 PROJ. NO. 78-501-254

CHKD. BY JTS DATE 8-11-78 SHEET NO. 2 OF 5

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PMF (PEAK FLOW)/AREA = 1575 CFS/SQ.MI. (REF: C OF E CURVE, OHIO RIVER BASIN)

PMF = (1575 CFS/SQ.MI.)(8.4 SQ. MI.) = 13,230 CFS

TOTAL TIME OF FLOW = 44.5 HRS (REF: C OF E CURVE, OHIO RIVER BASIN)

VOLUME OF INFLOW HYDROGRAPH

$V = \frac{1}{2}(Q_{I_{MAX}})(TIME)$

$= \frac{1}{2}(13,230\ CFS)(44.5\ HRS)(3600\ SEC/HR)(1\ ACRE/43,560\ SQ.FT.)$

$= 24,328$ AC-FT

DETERMINE AVERAGE RUNOFF REQUIRED TO PRODUCE THE ABOVE VOLUME OF INFLOW.

$(24,328\ AC\text{-}FT)(1\ SQ.MI./640\ ACRES)(12\ IN/FT)/(8.4\ SQ.MI.) = 54.3$ INCHES

VOLUMES PRODUCED BY RUNOFF IN EXCESS OF 26 INCHES ARE TO BE RECALCULATED USING 26 INCHES AS AN UPPER BOUND.

$(26\ INCHES)(8.4\ SQ.MI.)(640\ ACRES/SQ.MI.)(1\ FT/12\ IN) = 11,648$ AC-FT

VOLUME OF INFLOW (RECALCULATED) = 11,648

SUBJECT DAM SAFETY INSPECTION
TWO MILE RUN

BY DLB DATE 8-7-78 PROJ. NO. 78-501-754

CHKD. BY JTS DATE 8-11-78 SHEET NO. 3 OF 5

gai CONSULTANTS, INC
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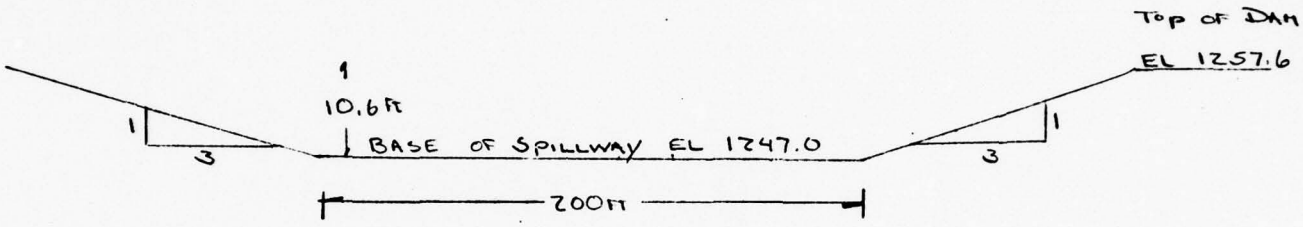
SPILLWAY CAPACITY



NOTE ; DIMENSIONS AND ELEVATIONS ARE TAKEN FROM REFERENCE NO. 1, DRAWINGS 3 AND 30

MAXIMUM SPILLWAY DISCHARGE = 23,500 CFS (REF 5; STD. DRWG NO ES 175, SHEET 9 OF 9, DATE 11-67

MAXIMUM DISCHARGE (23,500 CFS) > PEAK INFLOW (13,230 CFS)

SUBJECT DAM SAFETY INSPECTION
TWO MILE RUN

BY DLR DATE 8-7-78 PROJ. NO. 78-501-254

CHKD. BY JTS DATE 8-11-78 SHEET NO. 4 OF 5

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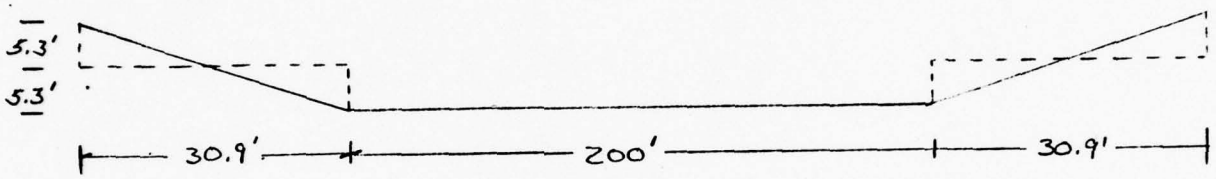
CONSIDER THE SPILLWAY CONTROL SECTION AS A BROAD-CRESTED WEIR

——— ACTUAL SPILLWAY SECTION
- - - - - ASSUMED SPILLWAY SECTION



BREADTH OF CREST = 30FT (REF 1; DRWG 30 OF 41)

C = DISCHARGE COEFFICIENT = 2.63 (REF 3: TABLE 21-15)

NOTE: THE ABOVE COEFFICIENT IS APPLICABLE TO BOTH THE 200FT SECTION UNDER 10.6FT OF HEAD AS WELL AS THE TWO 30.9FT SECTIONS UNDER 5.3FT OF HEAD.

$Q_1 = C L_1 H_1^{3/2}$ = FLOW ACROSS CENTER (200FT) SECTION

L_1 = 200FT
H_1 = 10.6FT

$Q_2 = C L_2 H_2^{3/2}$ = FLOW ACROSS END (30.9FT) SECTION

L_2 = 30.9FT
H_2 = 5.3FT

SUBJECT DAM SAFETY INSPECTION
TWO MILE RUN

BY DLB DATE 8-7-78 PROJ. NO. 78-50-254

CHKD. BY JTS DATE 8-11-78 SHEET NO. 5 OF 5

CONSULTANTS, INC.
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$Q_{TOTAL} = Q_1 + 2Q_2$

$Q_{TOTAL} = (2.63)(200FT)(10.6FT)^{3/2} + 2(2.63)(30.9FT)(5.3FT)^{3/2}$

$Q_{TOTAL} = 18,153\ CFS + 1983\ CFS$

$Q_{TOTAL} = 20,136\ CFS$

MAXIMUM DISCHARGE (20,136 CFS) > PEAK INFLOW (13,230 CFS)

APPENDIX D

PHOTOGRAPHS

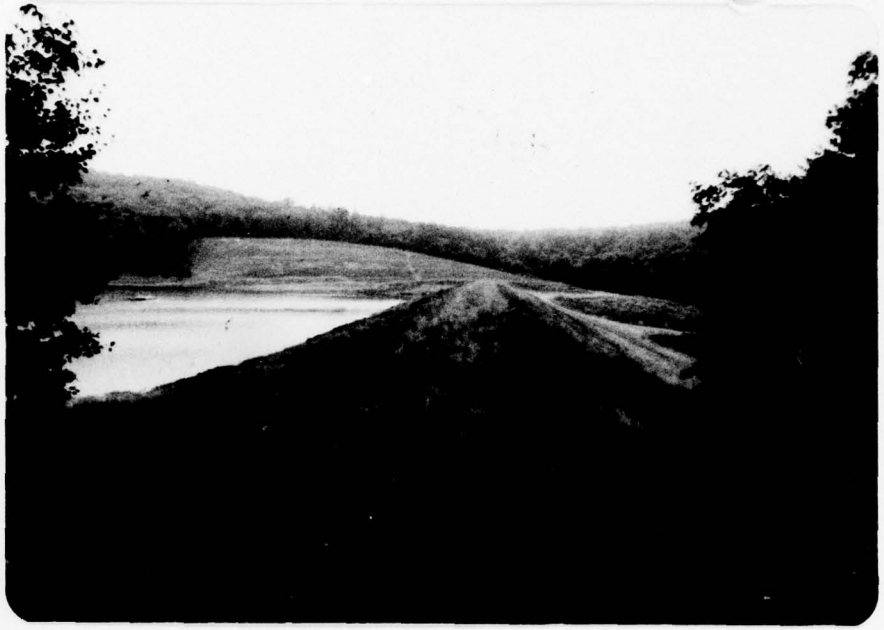
PHOTOGRAPH 1 View of Two Mile Run Dam from the left abutment. The spillway can be seen in the foreground. The inlet end of the outlet structure can be seen near the right center portion of the photo. Note the extent of the riprap on the upstream slope.

PHOTOGRAPH 2 View of Two Mile Run Dam taken from the right abutment.

PHOTOGRAPH 3 View of the downstream face of Two Mile Run Dam as seen from the access road approximately 500 ft. downstream of the crest.

PHOTOGRAPH 4 View of the grass covered emergency spillway located in the left abutment.

1



2

3

4

PHOTOGRAPH 5 Telephoto View of the outlet structure at Two Mile Run Dam. See photo 1 for reference.

PHOTOGRAPH 6 View of the discharge end of the outlet structure at Two Mile Run Dam. Considerable seepage was observed coming through the left outlet channel bank, shown on the right side of the photograph.

PHOTOGRAPH 7 View of seepage discharging through the right abutment just downstream of the dam.

PHOTOGRAPH 8 View looking downstream from the crest of the embankment showing the Two Mile Run Valley.

5

6

7

8

APPENDIX E

GEOLOGY

GEOLOGY*

The site of the Two Mile Run Dam and Reservoir is located near the southern limit of the glaciated portion of the Appalachian Plateau Physiographic Province.

The dam site and the whole of the drainage area is blanketed chiefly by glacial till of Illinoian age. Thin alluvial soils occur in the valley floodplain and residual soils occasionally occur immediately above bedrock. Thicknesses of glacial material generally exceed 20 feet. Where present, the alluvial and residual soils range from 2 to 5 feet thick.

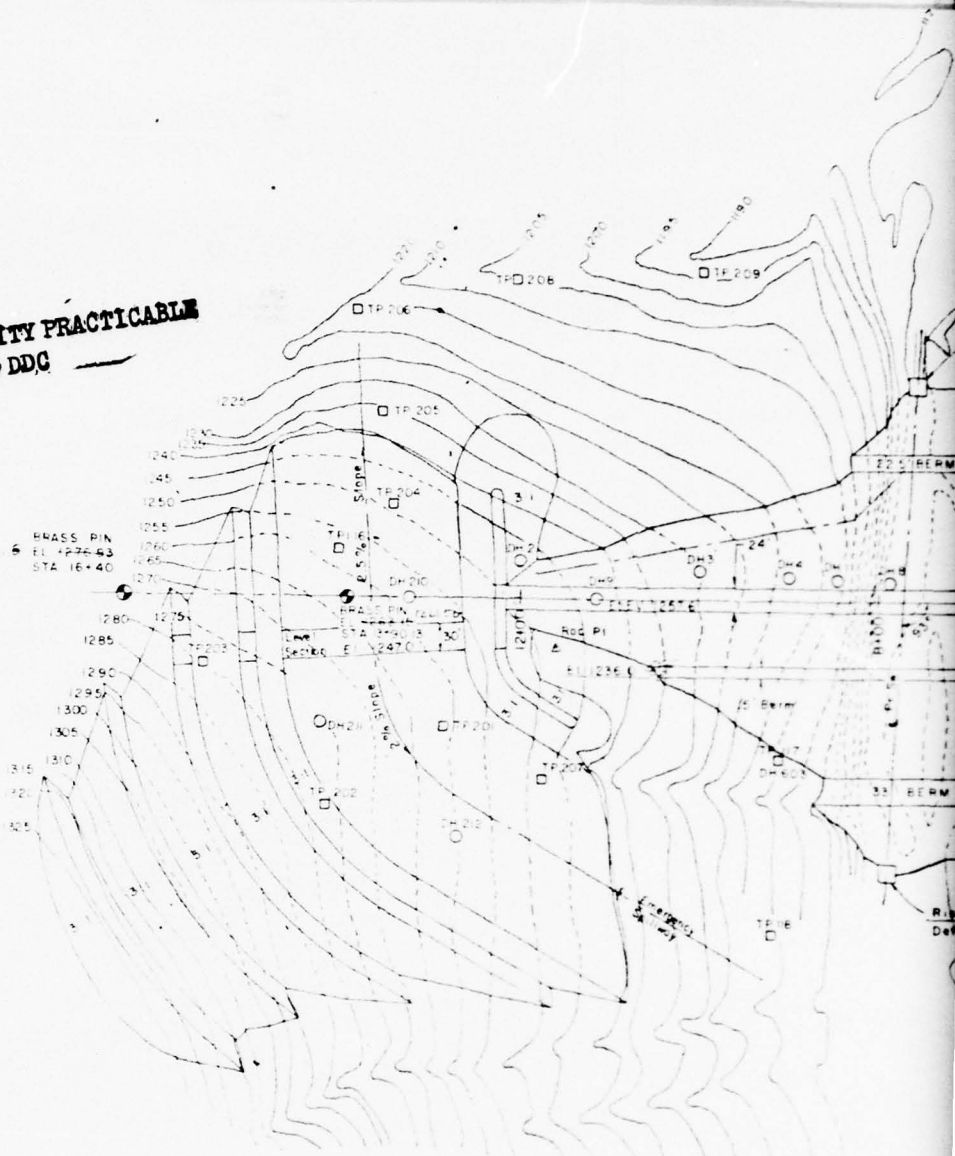
Bedrock includes the Mississippian age Pocono Group and the Pottsville Group of Pennsylvanian age. At the dam site, the Sharon Member of the Pottsville Group and the Pocono Group's Burgoon Member immediately underlie the dam. The Pottsville consists predominently of sandstone and conglomerates with thin shales and coals. The Pocono is chiefly sandstone interbedded with some shale and siltstone.

The rock strata are nearly horizontal with a slight dip to the southeast. Strong evidence of faulting was discovered at the dam site during pre-construction geologic investigations and also during construction of the dam. The suspected faulting is essentially normal to the dam centerline and may extend several thousand feet upstream and downstream of the dam. Measured displacements of 15 feet in the rock strata were noted during construction of the dam.

APPENDIX F

FIGURES

LIST OF FIGURES



LAYOUT OF ℄ DAM

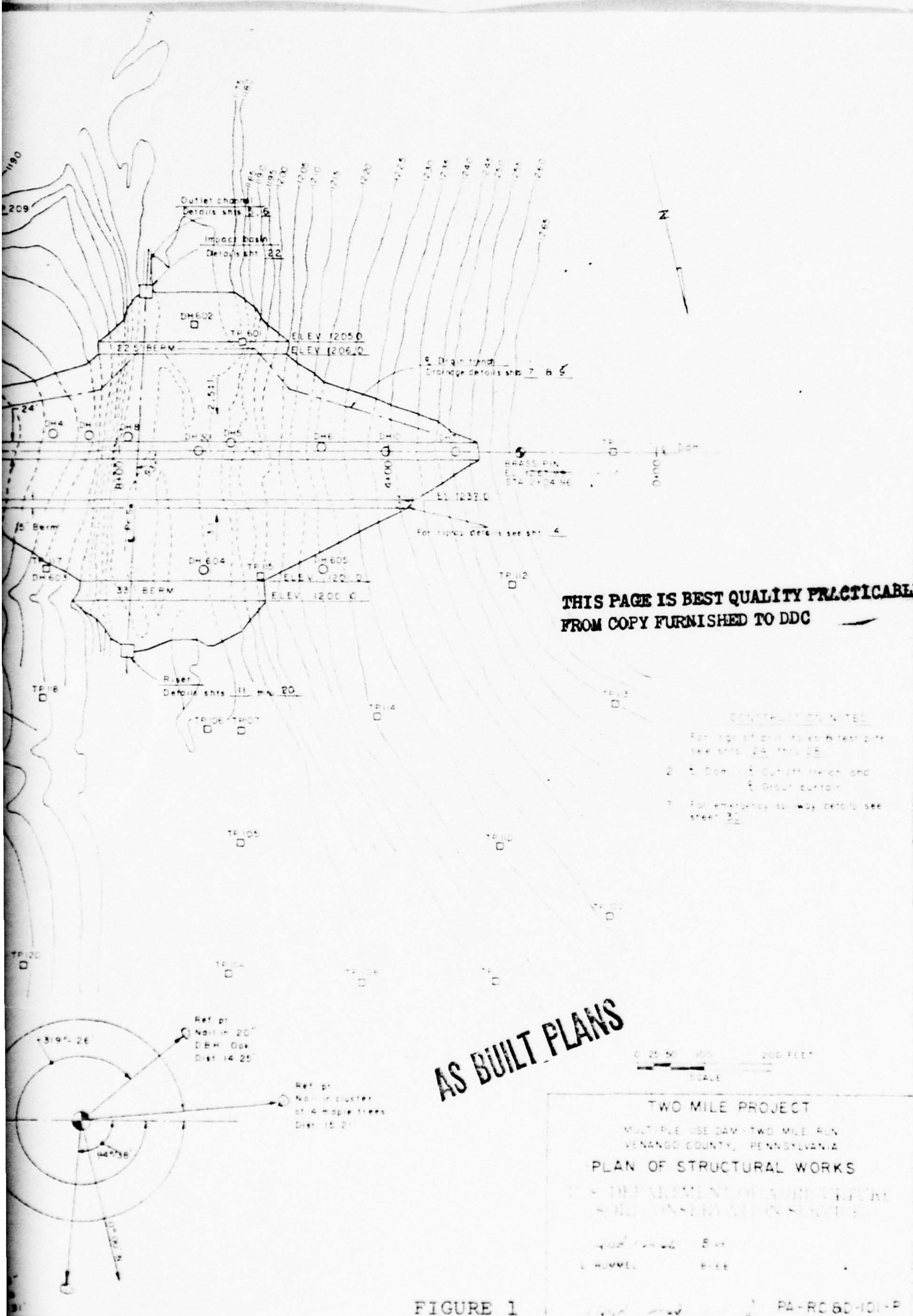
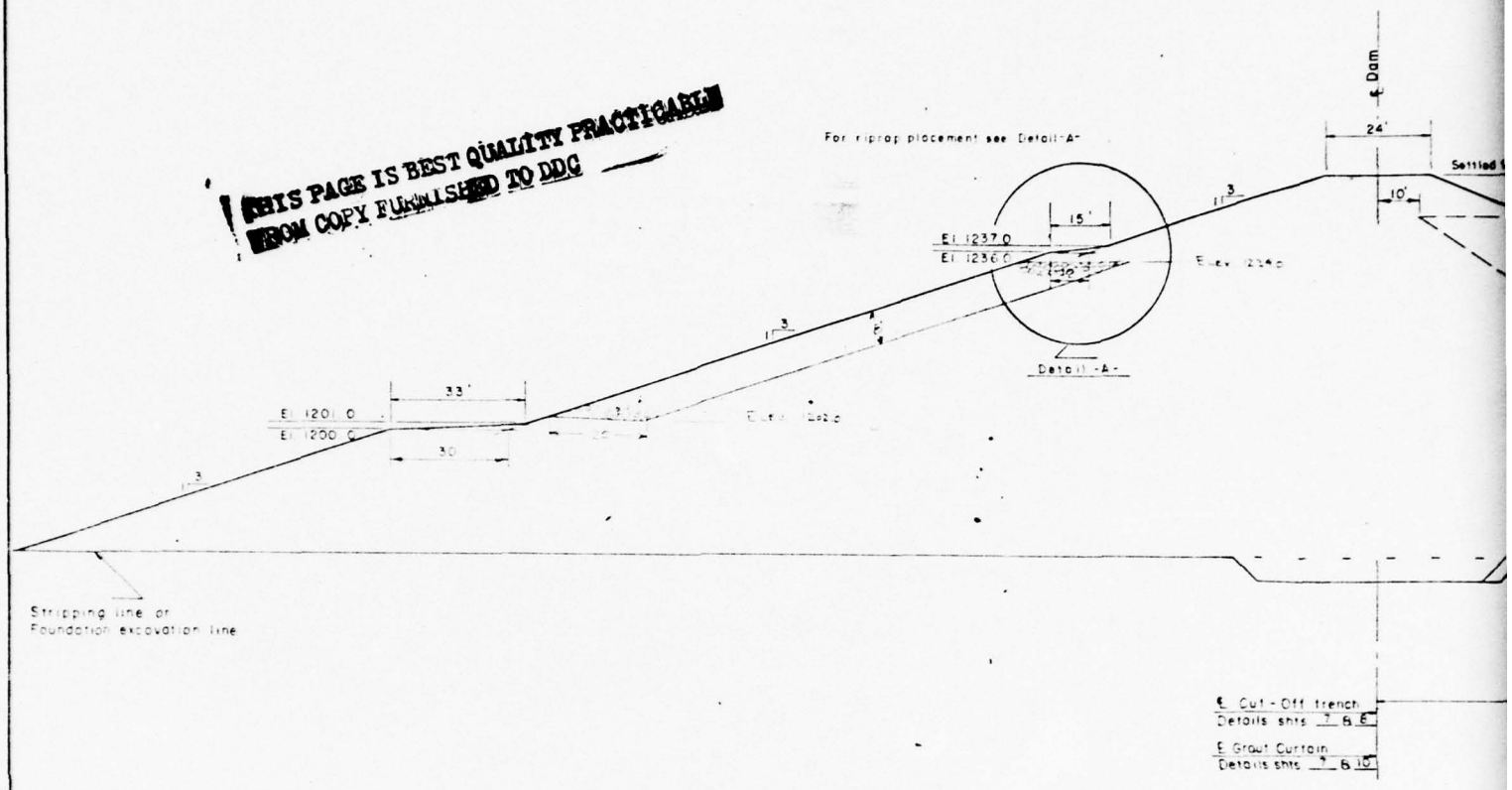
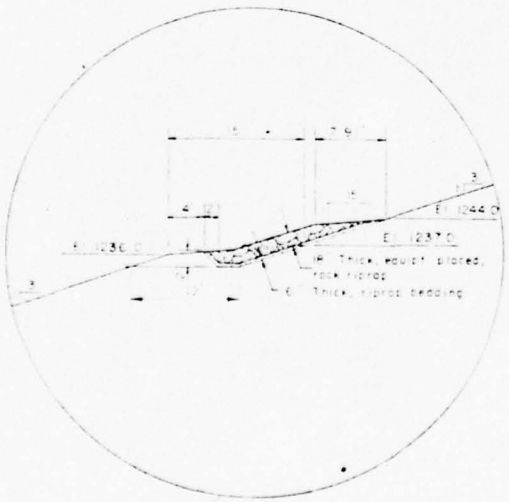


FIGURE 1



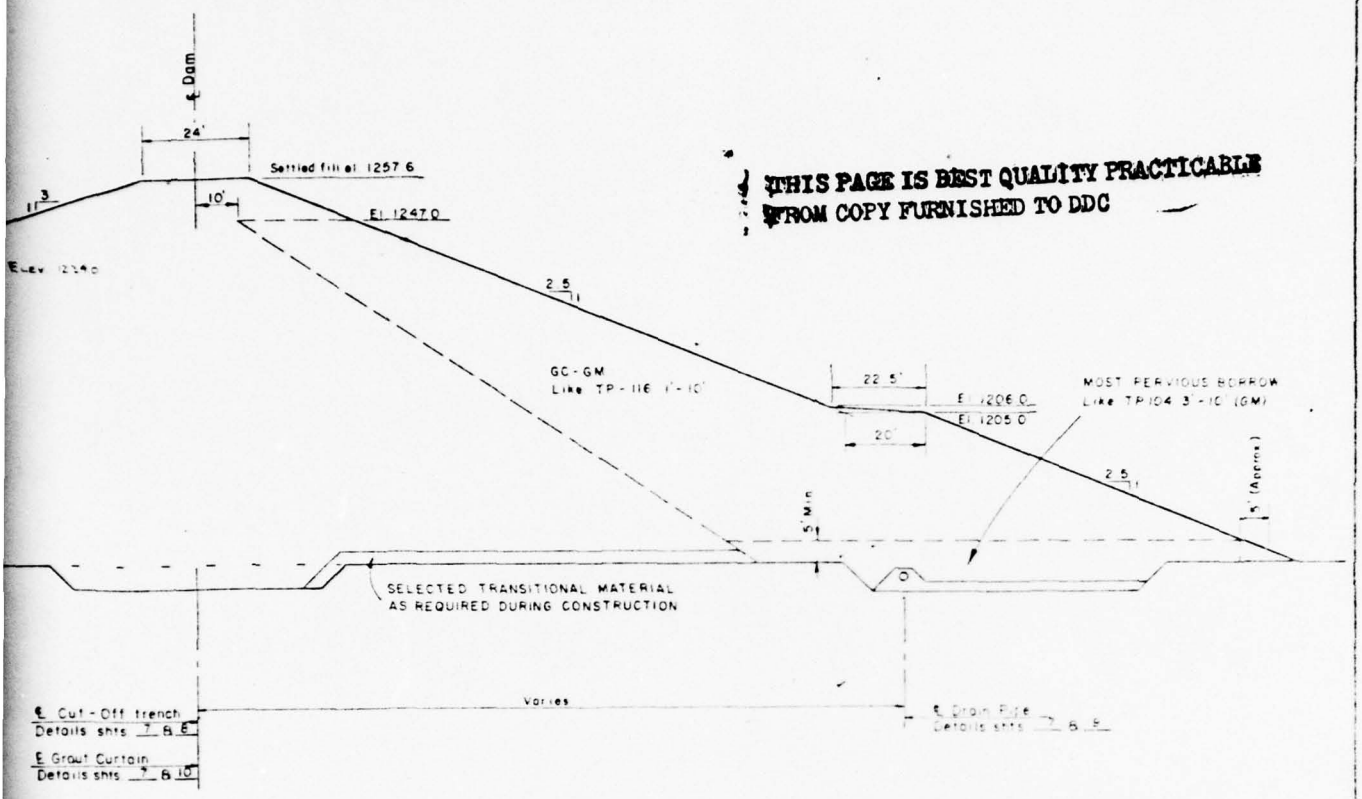
TYPICAL SECTION OF DAM

SCALE in FEET



Detail - A -

NOT TO SCALE



PICAL SECTION OF DAM

20 10 5 0 20

SCALE in FEET

Construction Notes

1. Constructed slopes are
   2.93 : 1 Upstream
   2.44 : 1 Downstream
2. For constructed fill elevations see sht 7
3. Riprap bedding shall meet fine drain (1) gradation limits (sheet 9)

Materia	Max [1] Rock Size	Max [2] Lift	Req'd [3] Water Content	Compaction [4] Class	Compaction [4] Definition
Materials as represented by TP 112 1, depth 2' - 11', classified as CL, by TP 119 1, depth 2' - 10', classified as CL Material as represented by TP 101 1, depth 6' - 9.5' classified as SC - SM, by TP 114 1 depth 1' - 10', classified as SC, by TP 116 1 depth 1' - 10', classified as SC - GM	6"	9"	Optimum or above	A	95 % max density by ASTM D 698, method A

[1] For fill adjacent to structures, max rock size 3"
[2] Maximum permissible lift thickness before compaction
[3] Water content of fill matrix at time of compaction
[4] For typical compaction curves see sht 29

Selective fill placement with the required CL to be place in center of fill and cut-off

TWO MILE PROJECT
MULTIPLE USE DAM - TWO MILE RUN
VENANGO COUNTY, PENNSYLVANIA

FILL PLACEMENT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

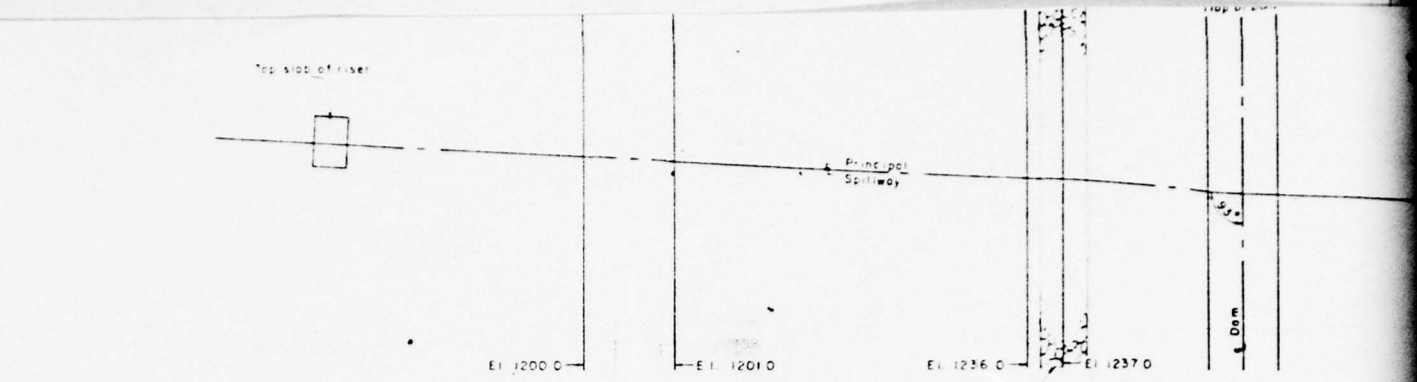
Richard A. Snyder 3-69
DRAWN 1-69

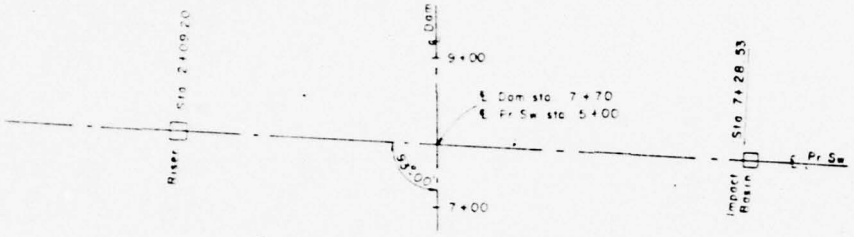
Richard A. Snyder 3-69 41 PA-RC & D-101-P

SCS-313-4-64

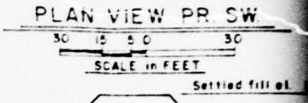
AS BUILT PLANS

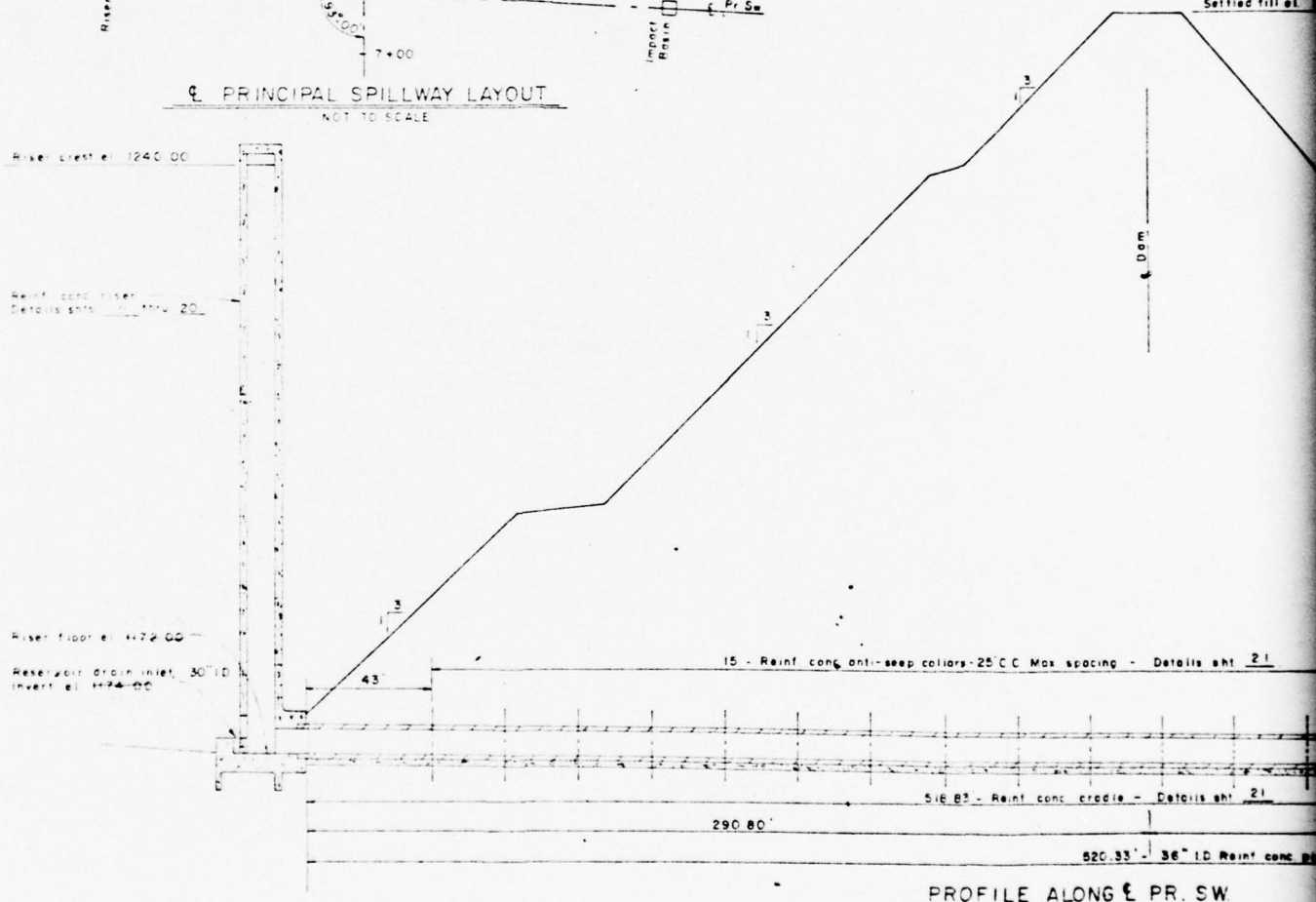
FIGURE 2

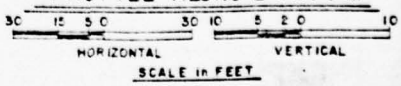




℄ PRINCIPAL SPILLWAY LAYOUT
NOT TO SCALE







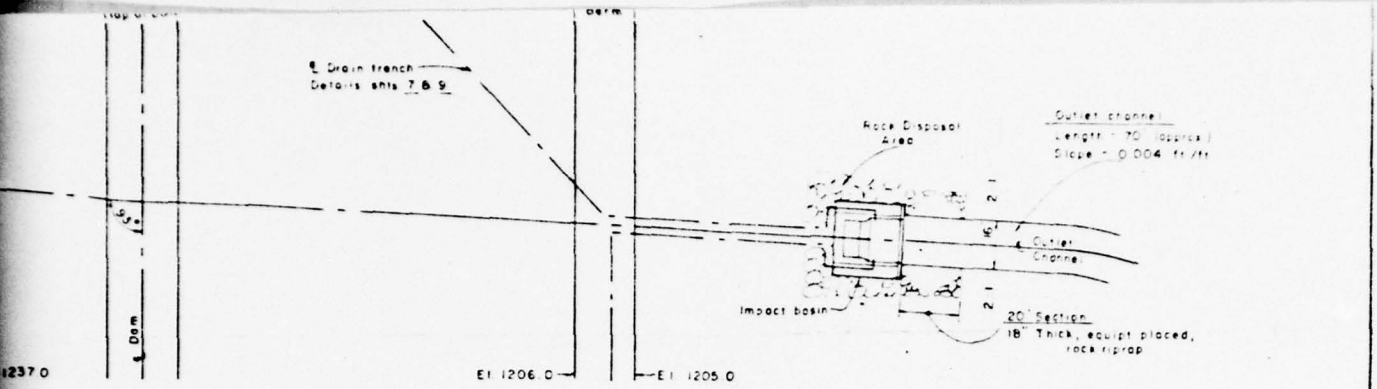
36" I.D. Reinforced Concrete Pressure Pipe, Steel Cylinder Type, Spec 109 (AWWA C-300 or C-301)

520' - Straight sections
1 - Spigot ring wall fitting (for 12" wall)
Pressure head = 74.5'
Load = 9,350 lbs per lin ft, based on O.D. of 3.81'
Min. 3 edge bearing strength for
0.01" Crack non-prestressed pipe = 24,450 lbs per lin ft
0.001" Crack prestressed pipe = 19,000 lbs per lin ft

520.33' - TOTAL

NOTE

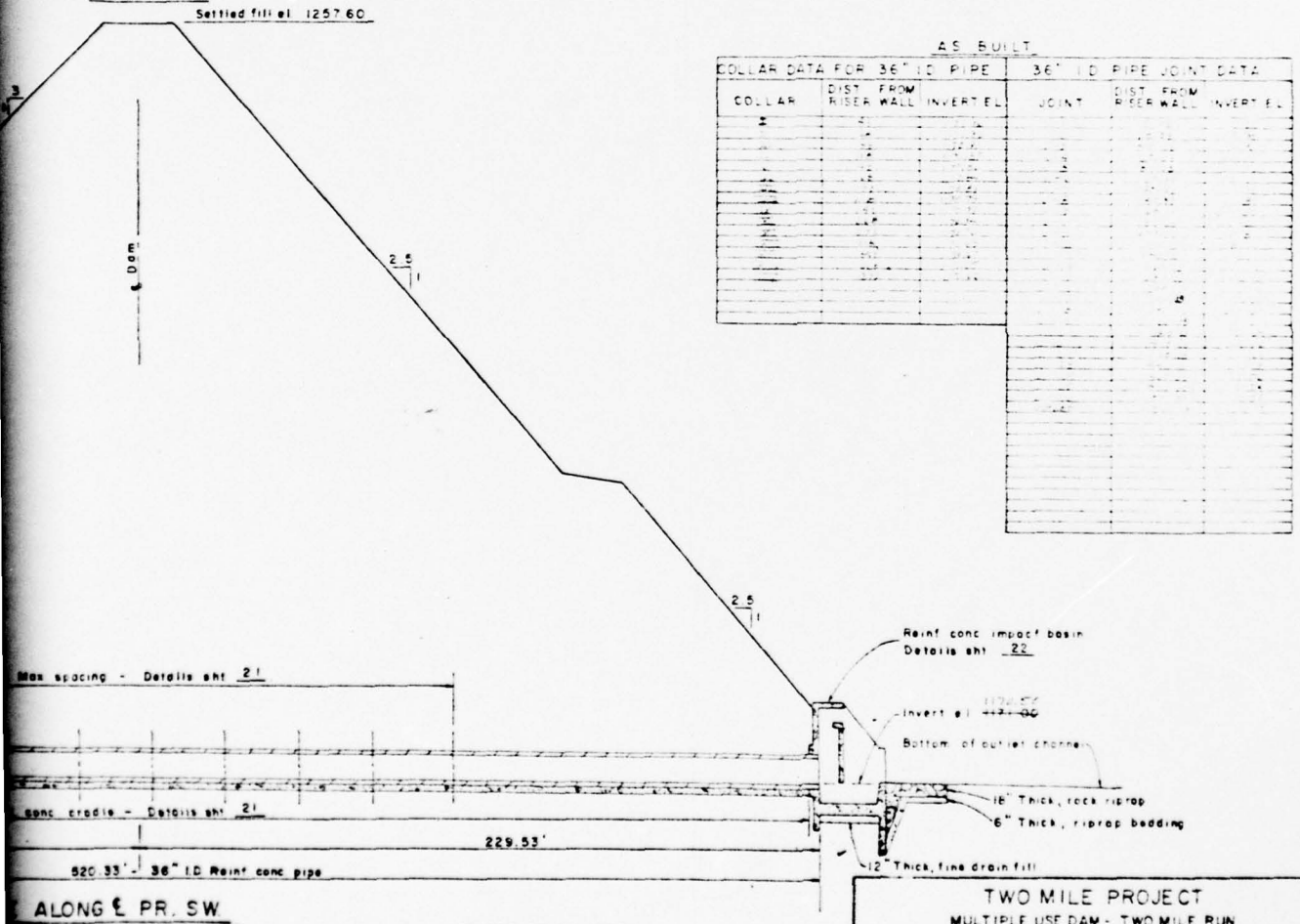
Where pipe furnished has an outside diameter greater than that called for on the plans, the 3 edge bearing strength must equal or exceed the specified strength multiplied by the ratio of outside diameter furnished to the outside diameter specified.



PLAN VIEW PR SW

30 15 5 0 30

SCALE in FEET



AS BUILT

COLLAR DATA FOR 36" I.D. PIPE			36" I.D. PIPE JOINT DATA		
COLLAR	DIST. FROM RISER WALL	INVERT EL.	JOINT	DIST. FROM RISER WALL	INVERT EL.

ALONG ℄ PR. SW

30 10 5 2 0 10

VERTICAL

ALE in FEET

CONSTRUCTION NOTES

1. Outlet end of pipe to be finished so that no metal is exposed.
2. Pipe layout data will furnished by the Engineer.
3. Riprap bedding shall meet fine drain fill gradation limits. (sht 9)

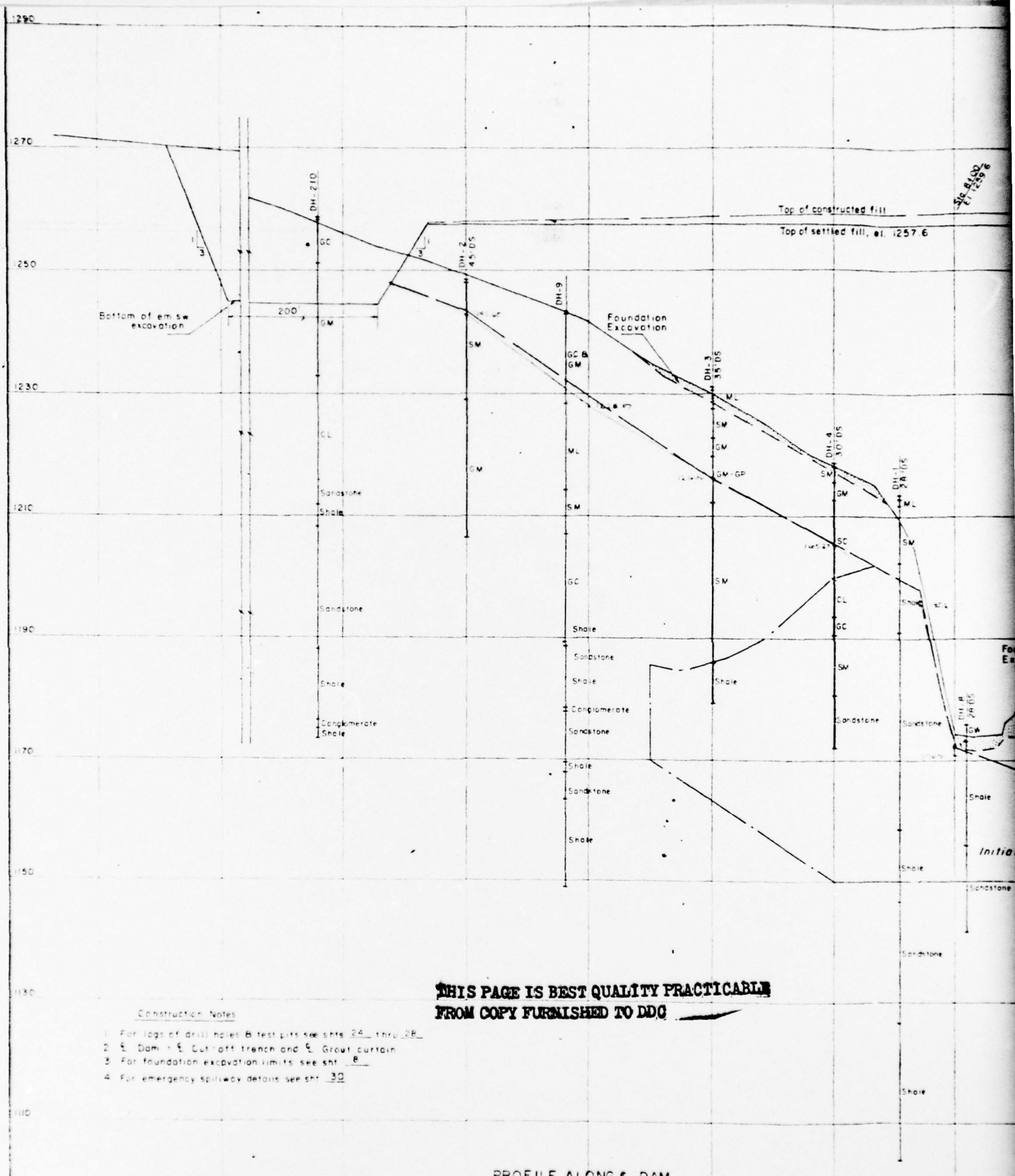
AS BUILT PLANS

TWO MILE PROJECT
MULTIPLE USE DAM - TWO MILE RUN
VENANGO COUNTY, PENNSYLVANIA
PRINCIPAL SPILLWAY
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Alfred S Snyder	10-68		
D CRISE	1-69		
Alfred S Snyder	3-69	41	PA-RC&D-101-P

FIGURE 3

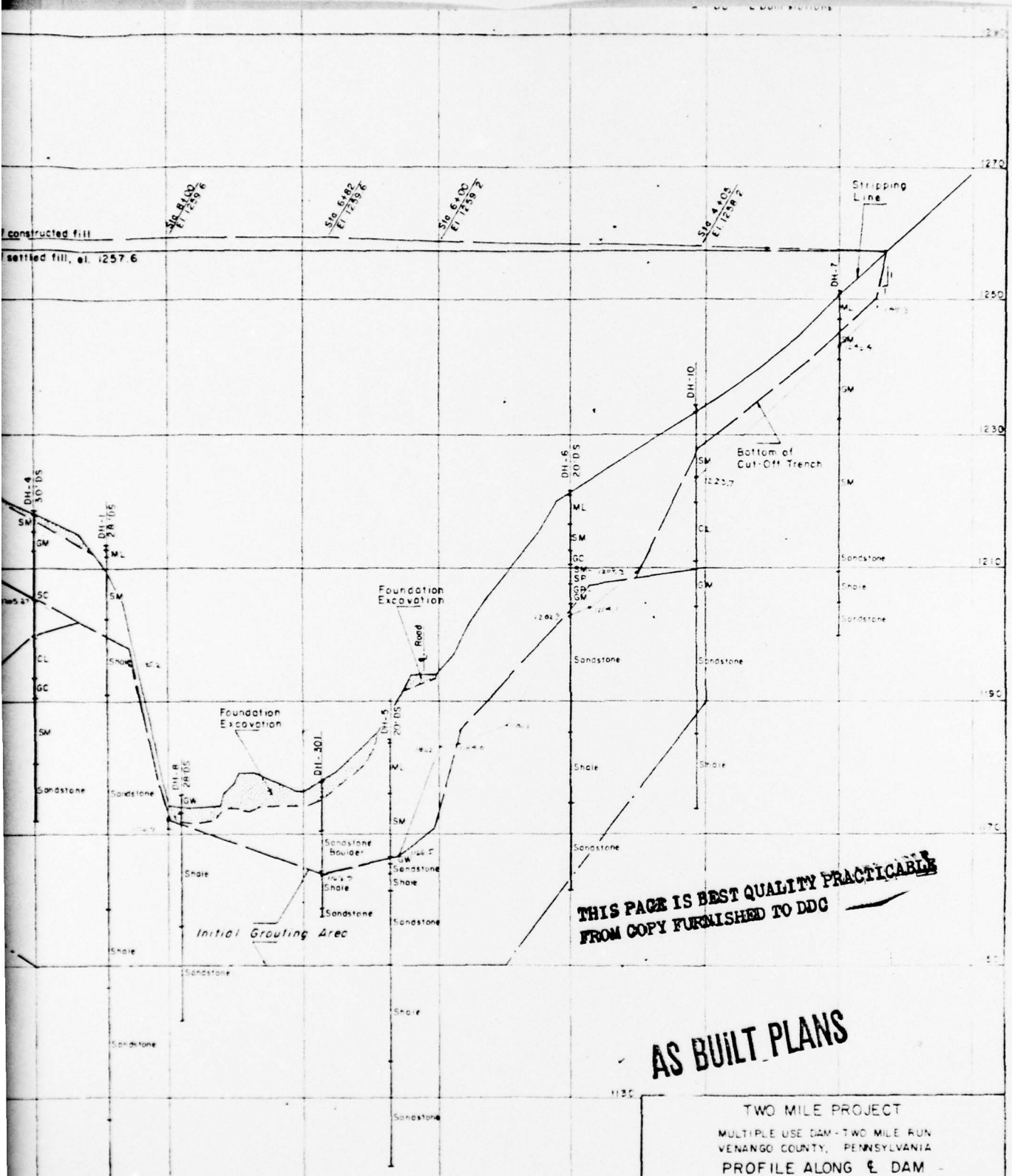
SCS-312 (9-68)



Construction Notes

1. For logs of drill holes & test pits see shts 24 thru 28
2. ℄ Dam - ℄ Cut-off trench and ℄ Grout curtain
3. For foundation excavation limits see sht 8
4. For emergency spillway details see sht 30

PROFILE ALONG ℄ DAM



AS BUILT PLANS

TWO MILE PROJECT

MULTIPLE USE DAM - TWO MILE RUN
VENANGO COUNTY, PENNSYLVANIA

PROFILE ALONG ℄ DAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

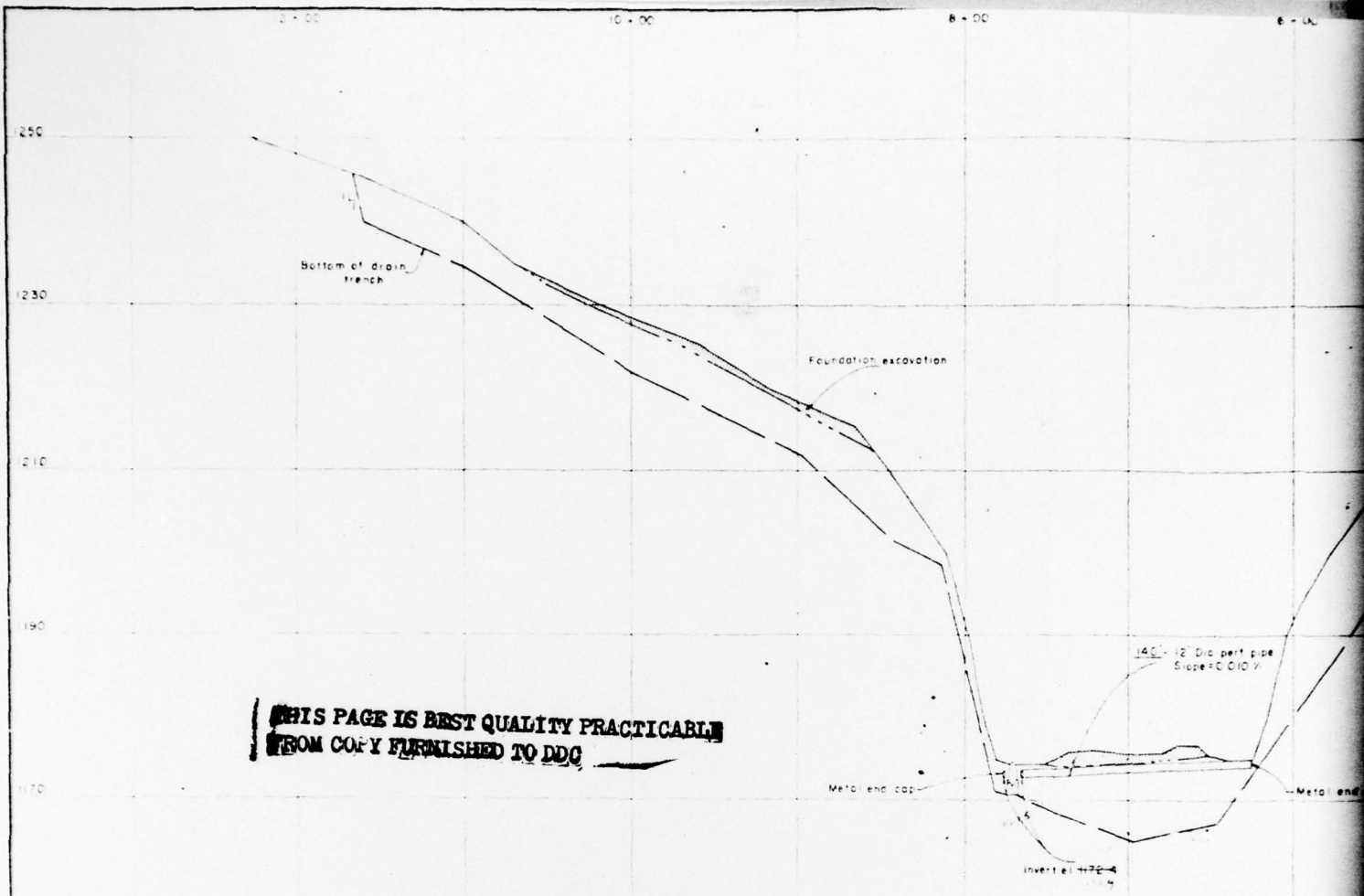
Alfred D. Snyder 10-68
C. CRISE 1-69
Alfred D. Snyder 8-69

PA-RC&D-101-P

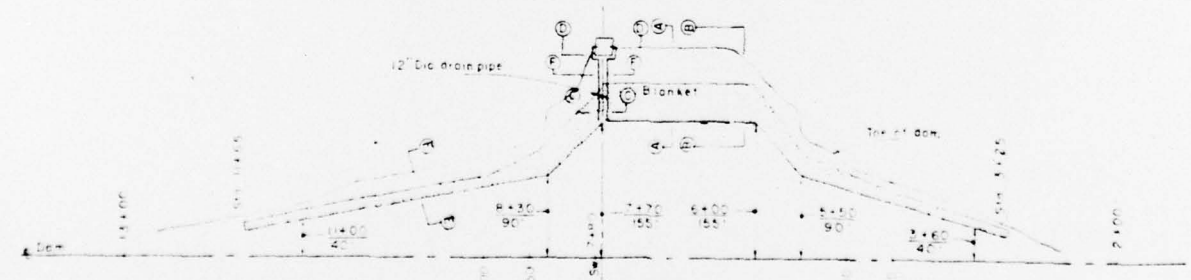
FIGURE 4

SCS-313 4-64

2

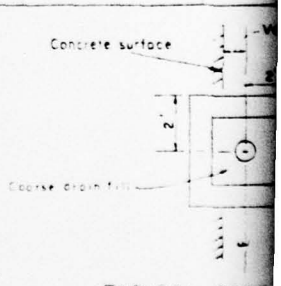


PROFILE ALONG ℄ DRAIN TRENCH
PROJECTED TO ℄ DAM LOOKING DOWNSTREAM

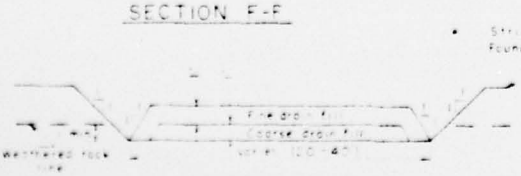


PLAN VIEW OF DRAINAGE AREA
SCALE IN FEET

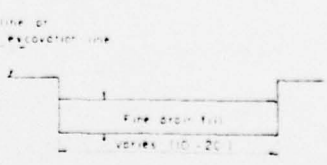
SECTION F-F



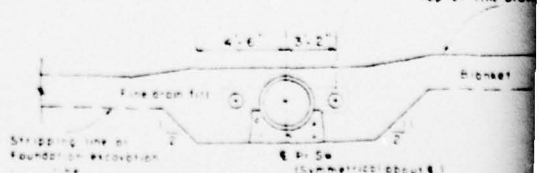
TYPICAL SECT
ALL PERFORAT
SECTIONS — NOT



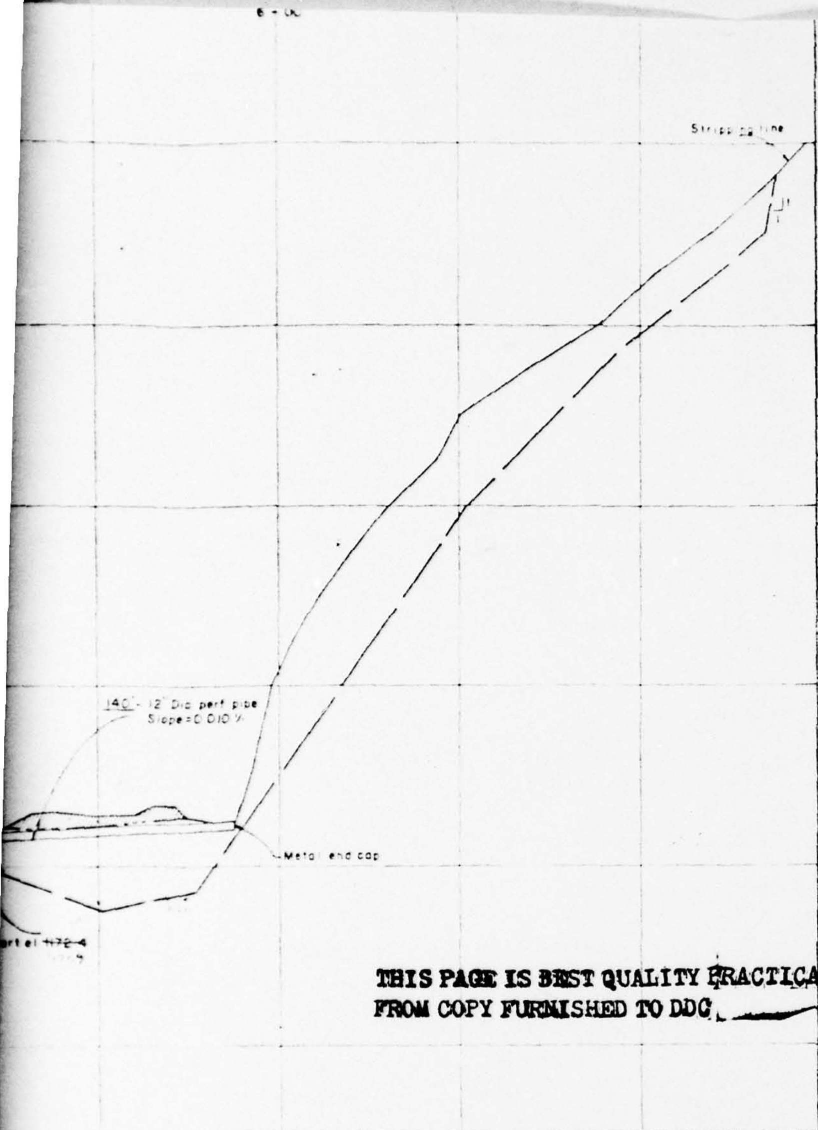
SECTION E-E (TRANSITION)



SECTION F-F (TRANSITION)



SECTION C-C



QUANTITY SUMMARY

4 - 10' Sections
13 - 20' Sections
1 - 1'x 1' Elbow 90°
4 - 1'-6" x 3'-3" Elbows 90°
2 - 1'-6" x 2'-6" Elbows 90°
2 - Metal end caps
2 - Small animal guards (details sht 23)
329' - Total

GRADATION LIMITS
(For Drain Fill)

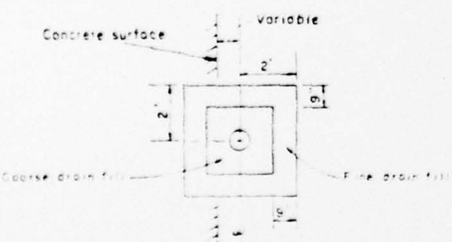
FINE DRAIN FILL

Sieve No	% Passing (based on dry weight)
3/8"	100
4	95-100
8	80-100
16	50-85
30	24-60
50	10-30
100	<10

COARSE DRAIN FILL

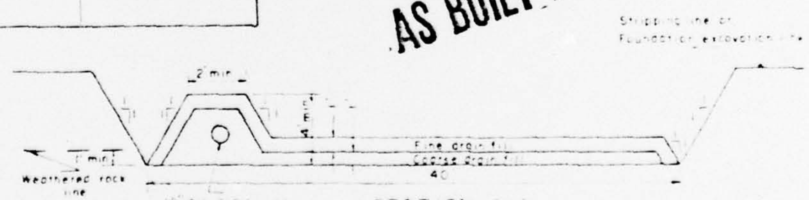
Sieve No	% Passing (based on dry weight)
3/4"	100
1/2"	85-100
3/8"	40-75
4	5-25
8	<10
16	<5

STATION	BOTTOM WIDTH	SECTION
3+25 - 4+50	10'	E
4+50 - 5+00	10' - 20'	E
5+00 - 6+00	20' - 40'	B
6+00 - 6+25	40'	B
6+25 - 7+80	40'	A
7+80 - 8+50	40' - 20'	B
8+50 - 9+00	20' - 10'	E
9+00 - 11+65	10'	E



TYPICAL SECTION AROUND ALL PERFORATED DRAIN PIPE

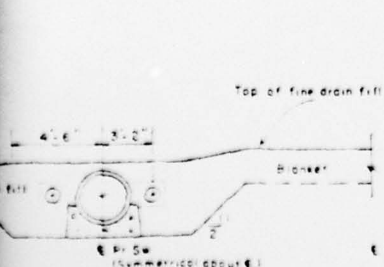
SECTIONS — NOT TO SCALE



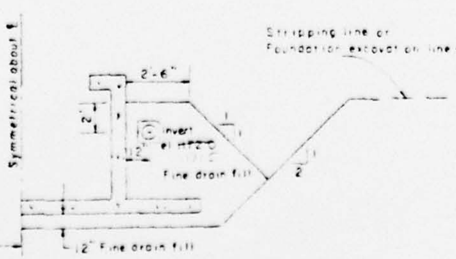
SECTION A-A

Construction Note

All drain pipe shall be 12" dia., Class I, Shape I, Type I, 16 gage, perforated (Spec 110)



SECTION C-C



SECTION D-D

TWO MILE PROJECT
MULTIPLE USE DAM - TWO MILE RUN
VENANGO COUNTY, PENNSYLVANIA

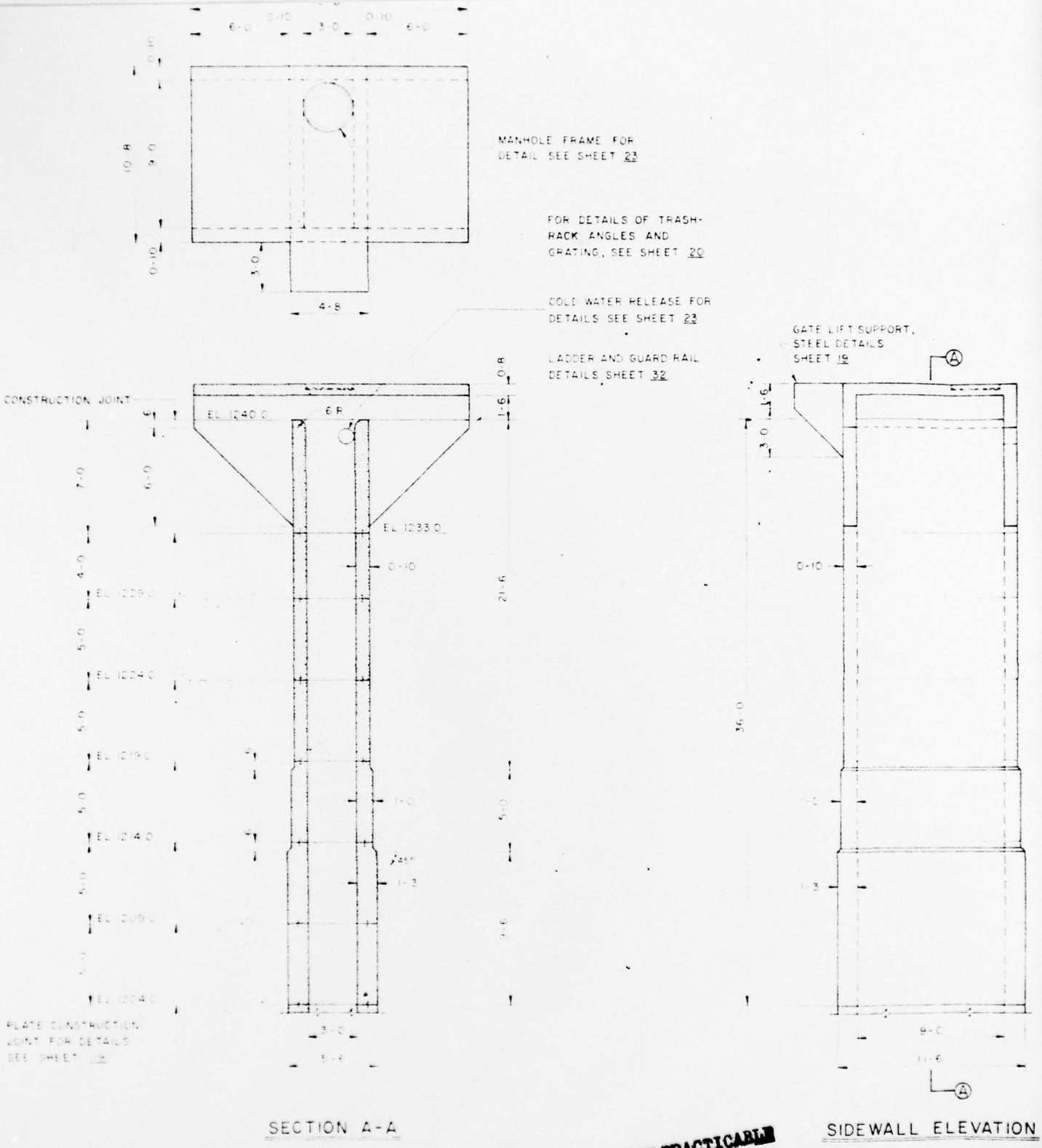
DRAINAGE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

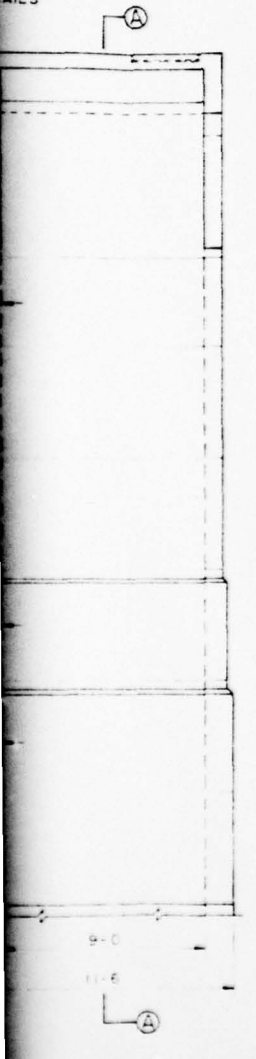
1-69

PA-RC&D-101-P

FIGURE 5



SUPPORT,
AILS

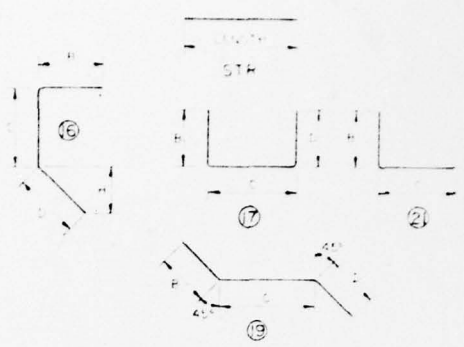


WALL ELEVATION

STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	D	H	TOTAL LENGTH
T1	5	16	6-6	STR					104-0
T2	5	12	9-8	STR					116-0
T3	5	16	6-9	STR					108-0
T4	5	6	8-10	STR					53-0
T5	5	6	8-10	STR					53-0
T6	5	28	9-0	21	3-0	6-0			252-0
T7	5	2	3-8	STR					7-4
T8	5	2	6-8	STR					13-4
T9	5	2	9-2	STR					18-4
T10	5	2	11-8	STR					23-4
T11	5	2	14-2	STR					28-4
T12	5	2	16-3	STR					32-6
T13	5	4	7-8	STR					30-8
T14	5	4	6-5	STR					25-8
T15	5	4	5-2	STR					20-8
T16	5	4	3-11	STR					15-8
T17	5	4	2-8	STR					10-8
T18	5	4	10-7	19	2-2	8-5			42-4
T19	5	2	4-3	STR					8-6
T20	5	2	6-8	STR					13-4
T21	5	2	9-2	STR					18-4
T22	5	2	11-8	STR					23-4
T23	5	2	14-2	STR					28-4
T24	5	2	16-3	STR					32-6
T25	5	4	7-8	STR					30-8
T26	5	4	6-5	STR					25-8
T27	5	4	5-2	STR					20-8
T28	5	4	3-11	STR					15-8
T29	5	4	2-8	STR					10-8
T30	5	4	10-7	19	2-2	8-5			42-4
T31	5	2	16-3	STR					32-6
T32	5	2	16-3	STR					32-6
T33	4	24	9-8	STR					232-0
T34	4	2	6-2	STR					12-4
T35	4	9	16-3	STR					146-3
T36	4	4	6-7	STR					26-4
T37	5	2	2-8	21	1-10	0-10			5-4
T38	5	28	7-9	21	1-10	5-11			217-0
T39	5	2	8-3	21	1-10	6-5			16-6
T40	4	4	6-7	STR					26-4
T41	4	9	16-3	STR					146-3
T42	5	9	6-8	17	1-3	4-2	1-3		60-0
T43	5	10	8-9	16	3-3	1-0	4-6	3-2	87-6
R14	5	26	11-7	STR					301-2
R15	5	8	11-7	STR					92-8
R16	5	30	9-6	STR					285-0
R17	5	14	9-6	STR					133-0
R18	5	20	10-0	STR					200-0
R19	5	14	4-0	STR					56-0
R20	7	40	10-6	21	3-9	6-9			420-0
R21	5	20	9-8	STR					193-4
R22	5	14	3-8	STR					51-4
R23	6	36	10-2	21	3-7	6-7			366-0
R24	6	4	9-8	21	3-4	6-4			38-8
R25	5	30	3-8	STR					110-0
R26	5	10	3-8	STR					36-8
R27	5	20	6-7	STR					131-8
R28	5	6	6-7	STR					39-6
R29	5	22	4-6	STR					99-0
R30	5	10	4-6	STR					45-0
R31	5	20	9-8	STR					193-4
R32	5	10	3-8	STR					36-8
R33	6	36	9-8	21	3-4	6-4			348-0
R34	6	4	9-4	21	3-2	6-2			37-4
R35	5	20	3-8	STR					73-8
R36	5	10	3-8	STR					36-8
R37	5	16	15-7	STR					249-4
R38	5	6	15-7	STR					93-6
R39	5	16	15-7	STR					249-4
R40	5	8	15-7	STR					124-8
R41	5	20	9-8	STR					193-4
R42	5	8	3-8	STR					29-4
R43	5	40	9-0	21	3-0	6-0			360-0
R44	5	14	9-8	STR					135-4
R45	5	8	3-8	STR					29-4
R46	5	32	9-0	21	3-0	6-0			288-0
R47	5	8	9-8	STR					77-4
R48	5	8	3-8	STR					29-4
R49	5	16	9-0	21	3-0	6-0			144-0

BAR TYPES



QUANTITIES (Riser Above Elev. 1204.0 only)

STEEL

No 4 Bars	5895	Ft =	394	Lbs
No 5 Bars	6847	Ft =	6054	Lbs
No 6 Bars	7900	Ft =	1187	Lbs
No 7 Bars	4200	Ft =	859	Lbs
			8494	Lbs

CONCRETE

Class 4000 46.27 Cu Yds Reinforced

AS BUILT PLANS

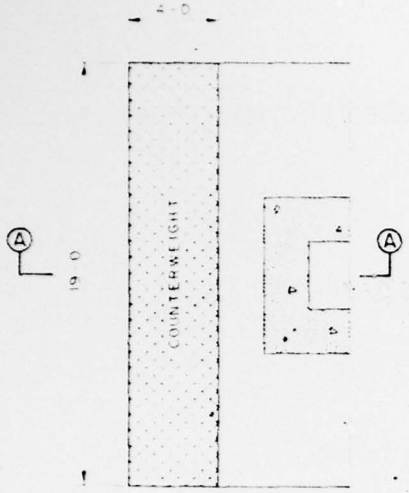
TWO MILE PROJECT
WARREN COUNTY, PENNSYLVANIA
STRUCTURAL DETAILS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-RC&D-10-P

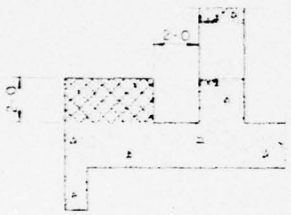
SCS-313C 6-64

FIGURE 6

2



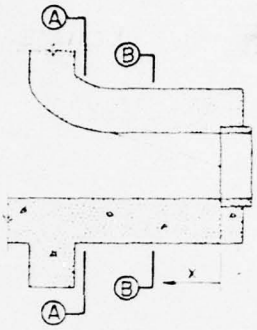
PLAN

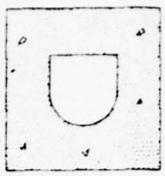


SECTION A-A

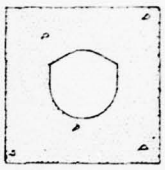
COUNTERWEIGHT

(CLASS 4000 CONCRETE
NON-REINFORCED)

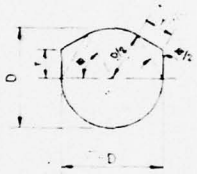




SECTION A-A



SECTION B-B



TYPICAL FROM X = 0.0'
TO X = 5.0'

TYPICAL FROM X = 5.0'
TO X = 8.5'

TRANSITION ELBOW DATA

$\Leftarrow = (X/5)(90°)$

$\Phi/2 = (X/5)(45°)$

$D/2 = 1.5'$

$T = (D/2)\tan \Phi/2$

X	$\Leftarrow$	$\Phi/2$	T
0'	0°	0°	0'
2.5	45°	22.5°	1.062'
5.0'	90°	45.0°	1.50'

TRANSITION ELBOW DETAILS

NOT TO SCALE

Symmetrical About ℄

"L" BOLT

Supply with washe

HIGH

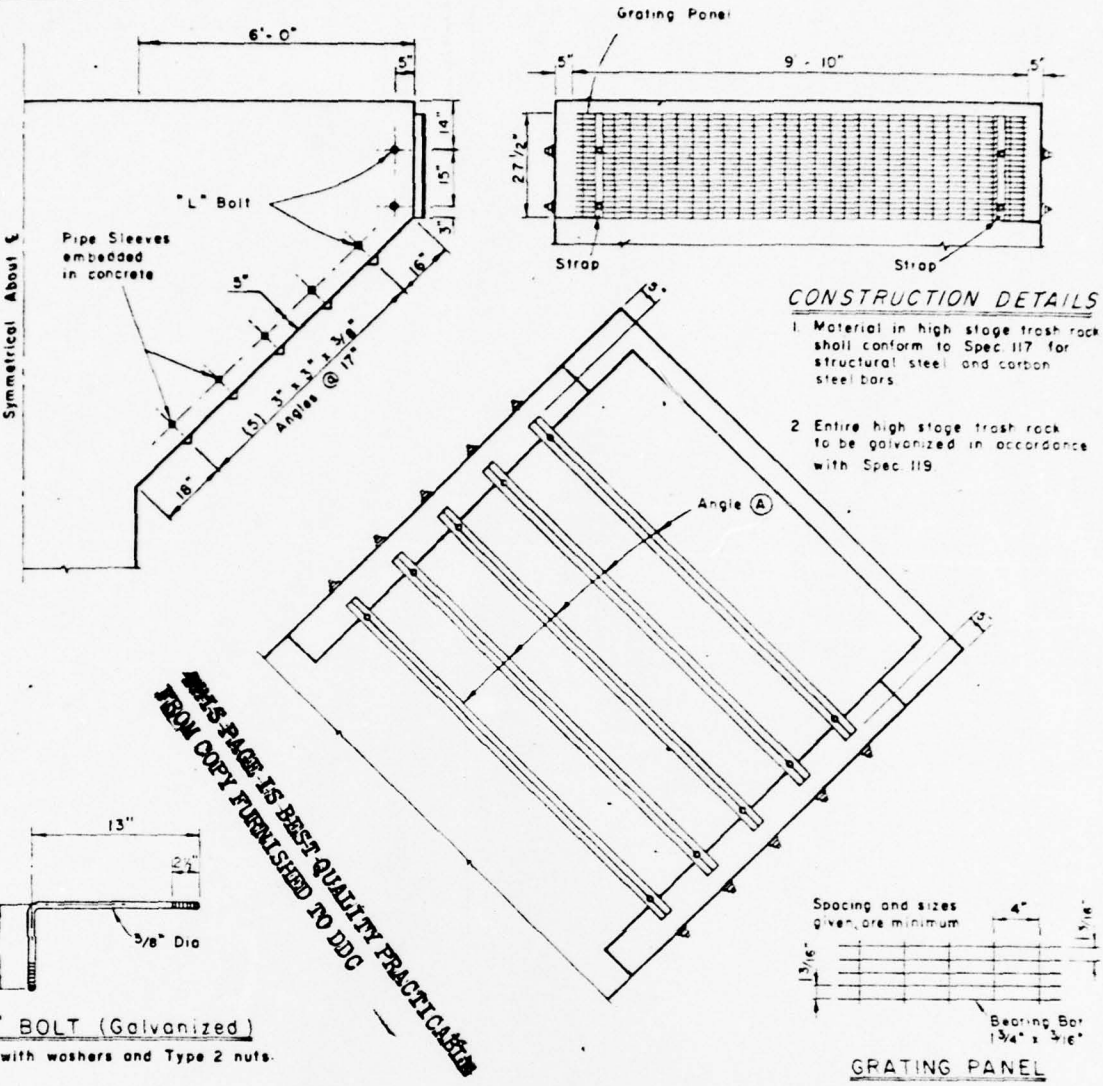
Angle

Strap

"L"

Grati

Sleev



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CONSTRUCTION DETAILS

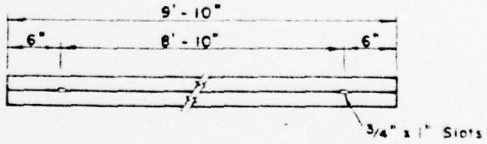
1. Material in high stage trash rack shall conform to Spec. 117 for structural steel and carbon steel bars.
2. Entire high stage trash rack to be galvanized in accordance with Spec. 119.

"L" BOLT (Galvanized)

Supply with washers and Type 2 nuts.

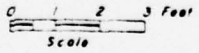
GRATING PANEL

STRAP



ANGLE (A)

HIGH STAGE TRASH RACK DETAILS



AS BUILT PLANS

HIGH STAGE TRASH RACK BILL OF MATERIALS

ITEM	SIZE	LENGTH	QUANTITY
Angles (A)	3" x 3" x 3/8"	9'-10"	10
Strap	1/4" x 2" x 27"	-	4
"L" Bolt	5/8" Dia	8" x 13"	28
Grating Panel	27 1/2" x 9'-10"	-	2
Sleeves	3/4" Dia	10"	28

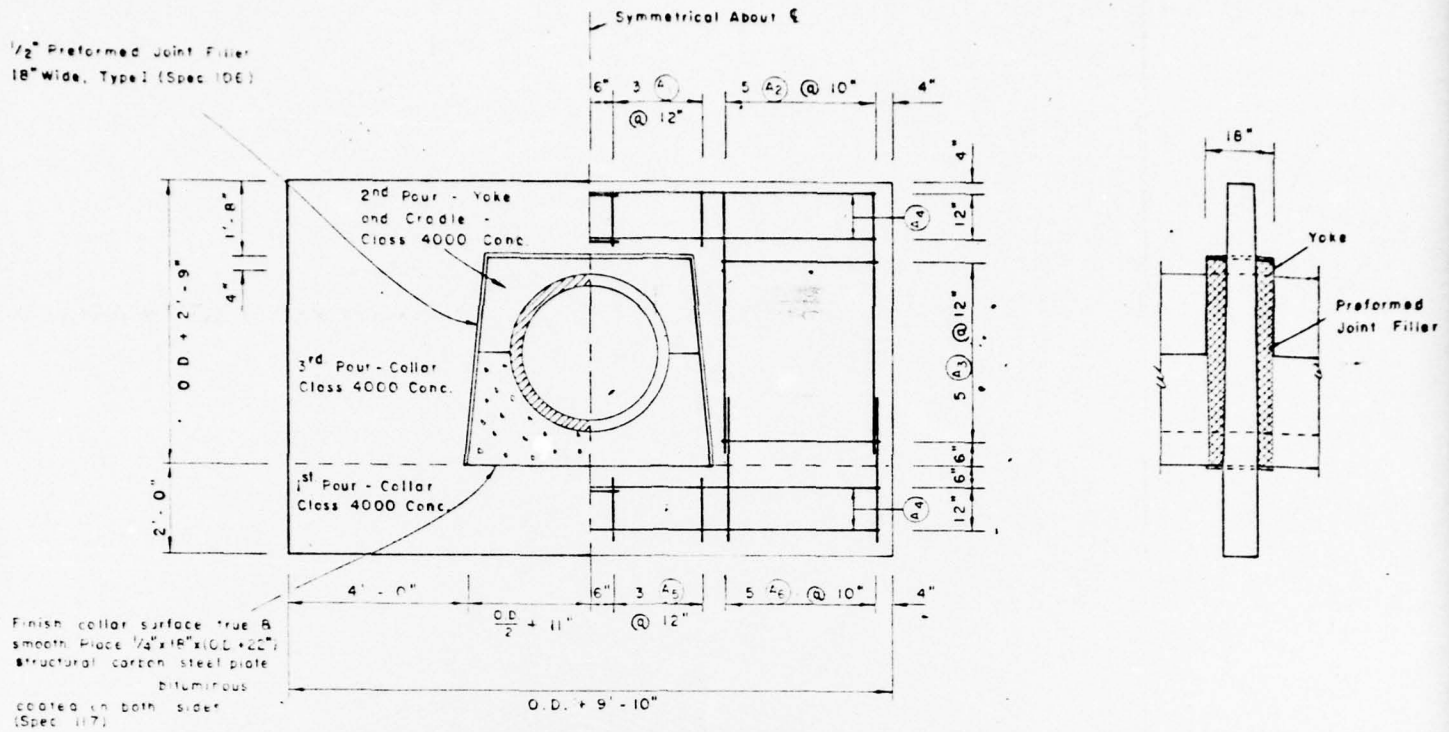
TWO MILE PROJECT
MULTIPLE USE DAM — TWO MILE RUN
VENANGO COUNTY, PENNSYLVANIA
RISER TRASH RACK

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed A. Alfred A. Snyder Date 1-69
Drawn C. CRISE 1-'69
Traced
Checked A. Alfred A. Snyder 3-69
Approved by
Title
Sheet No. 20 of 41
Drawing No. PA-RCBD-101-P

FIGURE 7

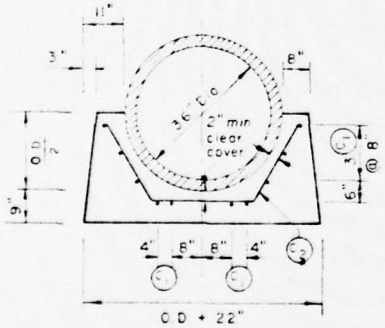
2



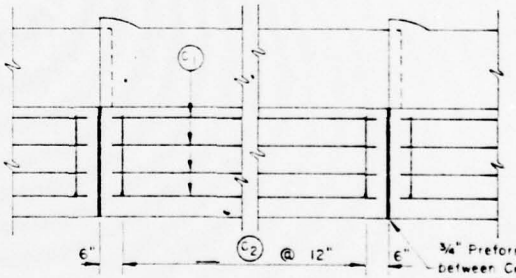
REINFORCED CONCRETE ANTI-SEEP COLLAR

NOT TO SCALE

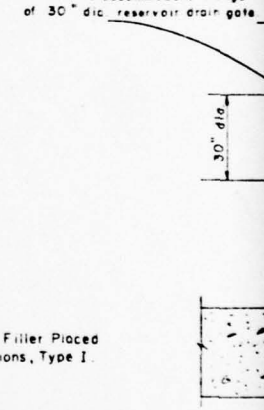
15 - Req'd



REINF. CONCRETE CRADLE (Class 4000 Conc.)

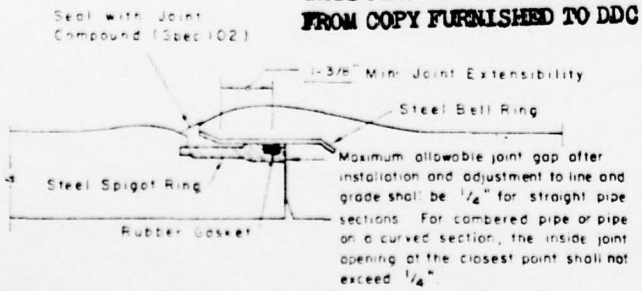


SIDE VIEW

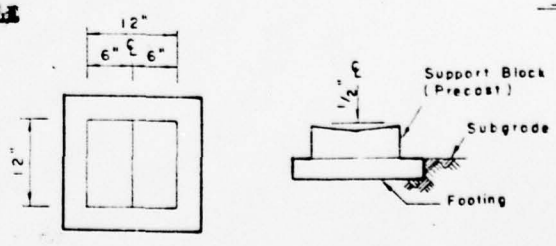


WALL T

NOT TO



REINFORCED CONCRETE PIPE - JOINT DETAILS

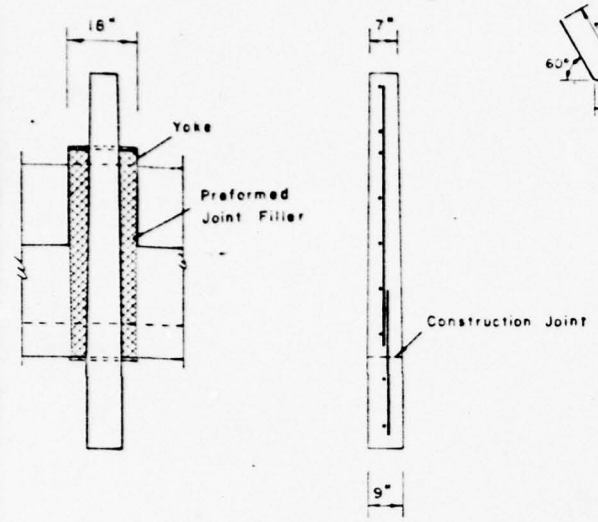


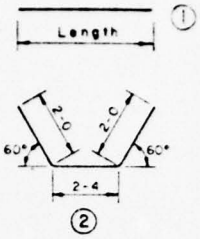
PLAN FRONT ELEV.

SUGGESTED SUPPORT BLOCK

NOTE The contractor shall determine the number and size of the blocks

1





ANTI-SEEP COLLAR STEEL SCHEDULE

Mark	Size	Length	Type	Quan / Collar	Total Quan	Total Length
A-1	4	1 - 3	1	6	90	112 - 6
A-2	4	6 - 0	1	10	150	900 - 0
A-3	4	3 - 6	1	10	150	525 - 0
A-4	4	7 - 6	1	8	120	900 - 0
A-5	4	1 - 6	1	6	90	135 - 0
A-6	4	3 - 9	1	10	150	562 - 6

NOTE

Bar lengths do not change with changes in outside diameter of pipe.

QUANTITIES (This Sheet Only)

STEEL

No. 4 Bar 6,428.3' x 4.294 Lbs

No 6 Bar, ~~8,736.6'~~ x ~~2.663~~ Lbs

~~11,099~~ Lbs

CONCRETE

Class 4000 205.0 Cu Yds Based on O.D. = 3.8 Ft

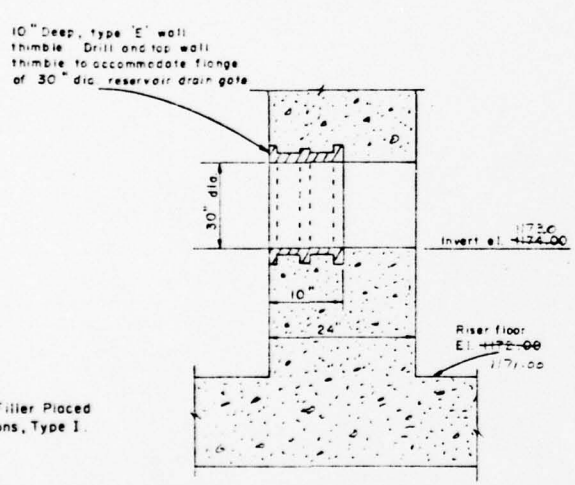
CRADLE STEEL SCHEDULE (16' SECTIONS)

Mark	Size	Length	Type	Quan / Section	Total Quan	Total Length
C-1	6	15-6	1	10	320	4960-0
C-2	4	6-4	2	16	520	3293-4
C-3	6	7-6	1	10	10	75-6

* Used in 8' Section in place of (C-1)

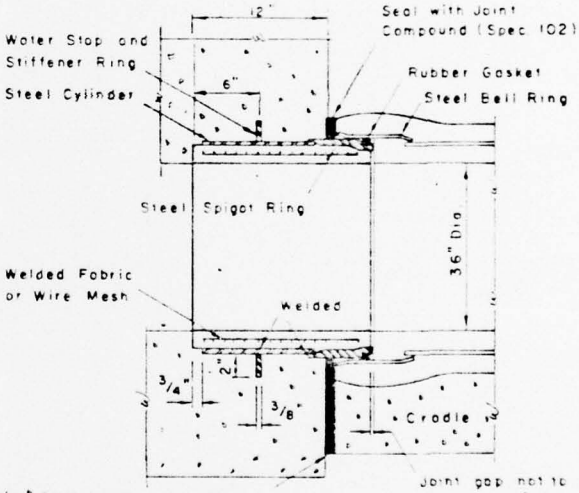
CRADLE STEEL SCHEDULE (20' SECTIONS)

Mark	Size	Length	Type	Quan / Section	Total Quan	Total Length
C-1	6	19-6	1	10	~~200~~	~~3900-0~~
C-2	4	6-4	2	20	520	3293-4



WALL THIMBLE

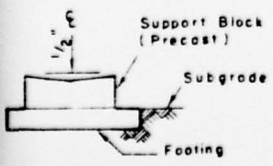
NOT TOSSCALE



AS BUILT PLANS

SPIGOT WALL FITTING

NOT TO SCALE



FRONT ELEV

PORT BLOCK

all determine the
blocks

TWO MILE PROJECT

MULTIPLE USE DAM - TWO MILE RUN

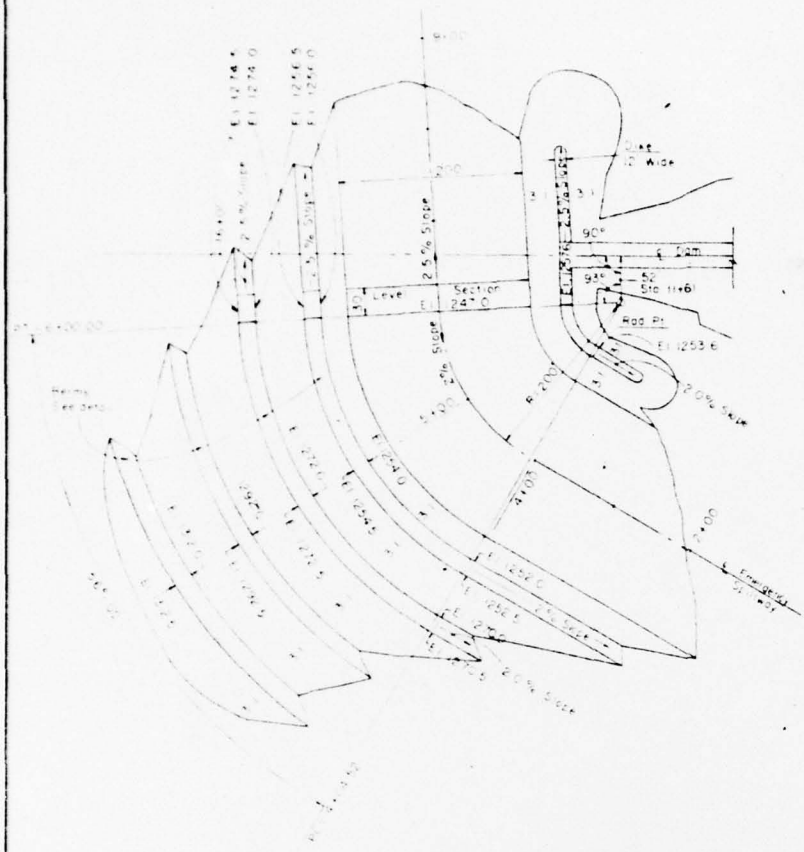
VENANGO COUNTY, PENNSYLVANIA

CONDUIT DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed ... Date ...
Drawn ... Approved by ...
Traced ... Date ...
Checked ... Scale 1" = 4' Drawing No. PA-RCBD-101-P

FIGURE 8



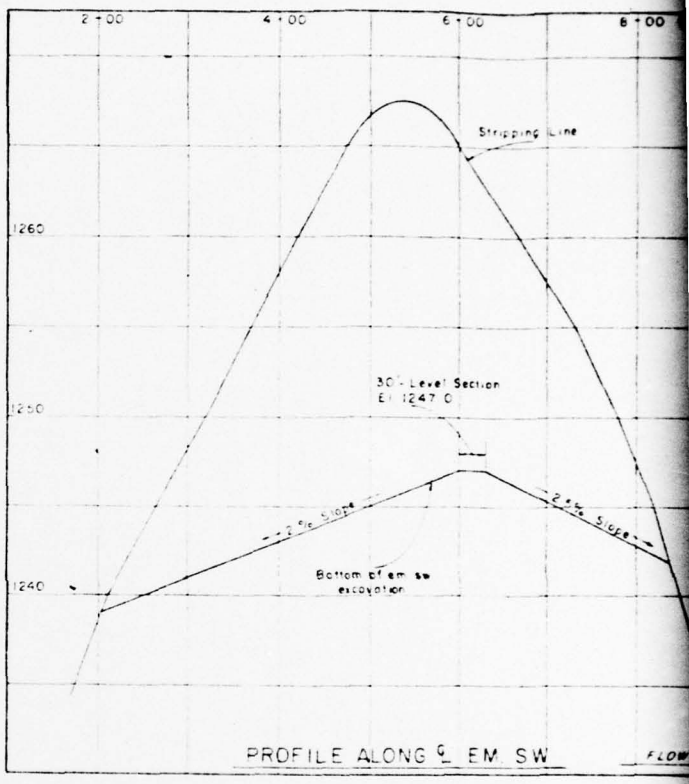
EM SW LAYOUT

SCALE 1 FEET

℄ EMERGENCY SPILLWAY CURVE DATA

	STATION	DEFLECTION ∠	CHORD
PC	4+04 52	0°-00	48 75
	4+53 39	7°-00	
	5+02 26	14°-00	
	5+51 13	21°-00	
PT	6+00 00	28°-00	

I =
R =
E =
M =
C =
Lc =
T =



PROFILE ALONG ℄ EM SW

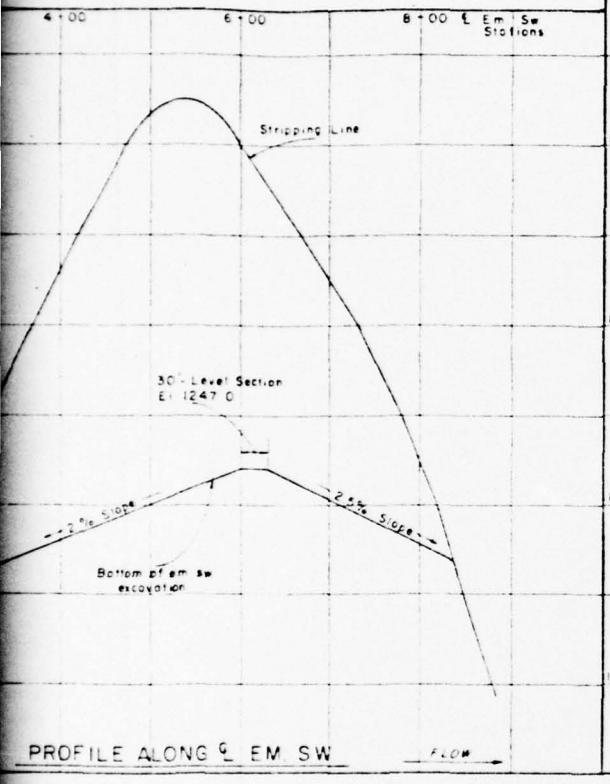
FLOW

TYPICAL SECTION EM SW BERMS

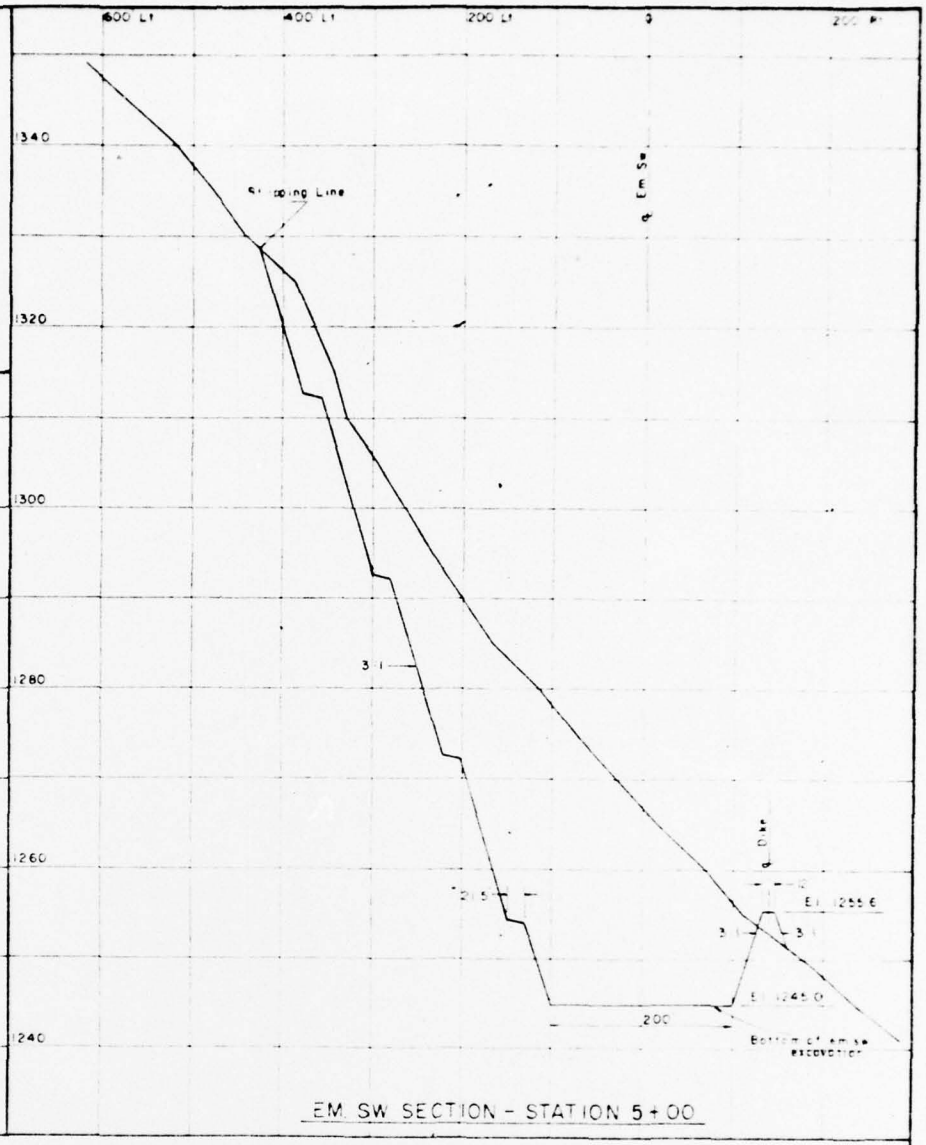
℄ EMERGENCY SPILLWAY CURVE DATA

	STATION	DEFLECTION ℄	CHORD
PC	4+04.52	0°-00'	48.75'
	4+53.39	7°-00'	
	5+02.26	14°-00'	
	5+51.13	21°-00'	
PT	6+00.00	28°-00'	

I = 56°
R = 200'
E = 26.51'
M = 23.41'
C = 187.79'
Lc = 195.48'
T = 106.34'



PROFILE ALONG ℄ EM. SW.



EM. SW. SECTION - STATION 5+00

CONSTRUCTION NOTE

For em. sw. drain details see sht. 3

AS BUILT PLANS

TWO MILE PROJECT
MULTIPLE USE DAM - TWO MILE RUN
VENANGO COUNTY, PENNSYLVANIA

EMERGENCY SPILLWAY

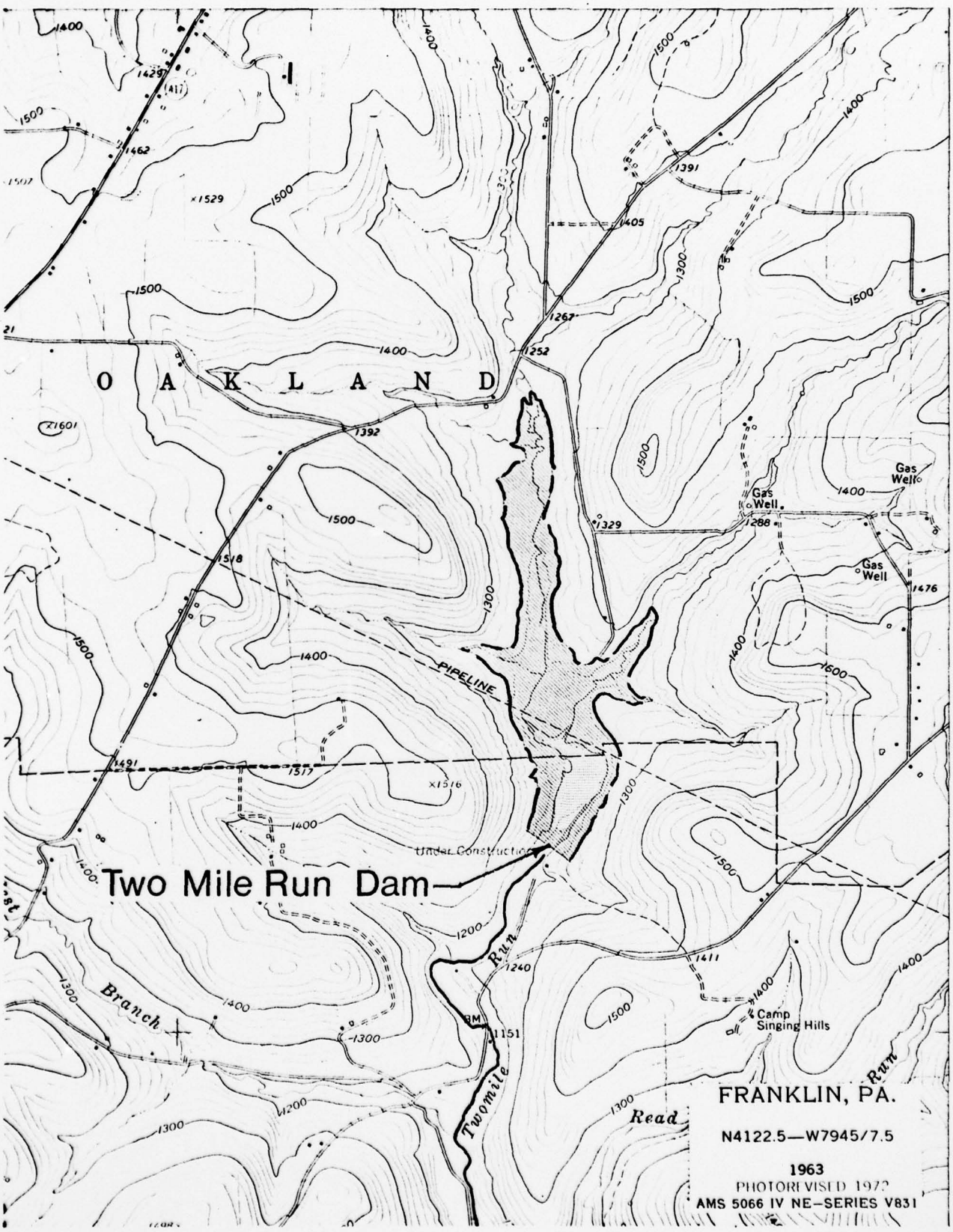
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-RC & D-101-P

FIGURE 9

APPENDIX G

REGIONAL VICINITY MAP


OAKLAND
Two Mile Run Dam
Under Construction
PIPELINE
Gas Well
Gas Well
Gas Well
Camp Singing Hills
Twomile Run
Read Run
Branch
BM 1151
FRANKLIN, PA.
N4122.5—W7945/7.5
1963
PHOTOREVISED 1972
AMS 5066 IV NE—SERIES V831